COMPACT PHOTO DENSITY COMPENSATED NEUTRON MICRORESISTIVITY LOG

Weatherford®

COMPANY	WESTERN OPERATING COMPANY
WELL	FOX #1-8
FIELD	HELFRICH
PROVINCE/COUNTY	HAMILTON
COUNTRY/STATE	U.S.A. / KANSAS
LOCATION	335' FNL & 495' FWL

SEC	TWP	RGE	Other Services
8	25S	42W	MAI/MFE

API Number 15-075-20866
Permit Number

Permanent Datum GL, Elevation 3596 feet
Log Measured From KB
Drilling Measured From KB

Elevations:	feet
KB	3609.00
DF	3608.00
GL	3596.00

Date	16-JAN-2013			
Run Number	ONE			
Service Order	3537806			
Depth Driller	5400.00	feet		
Depth Logger	5400.00	feet		
First Reading	5381.00	feet		
Last Reading	2300.00	feet		
Casing Driller	850.00	feet		
Casing Logger	842.00	inches		
Bit Size	7.875			
Hole Fluid Type	CHEMICAL	lb/USg		
Density / Viscosity	9.40 lb/USg	50.00 CP		
PH / Fluid Loss	9.50	9.50		
Sample Source	FLOWLINE			
Rm @ Measured Temp	0.58 @ 73.0	ohm-m		
Rmf @ Measured Temp	0.46 @ 73.0	ohm-m		
Rmc @ Measured Temp	0.70 @ 73.0	ohm-m		
Source Rmf / Rmc	CALC	CALC		
Rm @ BHT	0.37 @119.0	ohm-m		
Time Since Circulation	4 HOURS			
Max Recorded Temp	119.00	deg F		
Equipment / Base	13096	LIB		
Recorded By	ADAM SILL			
Witnessed By	PETER DEBENHAM			
JOB #	LB13-012			

BOREHOLE RECORD

Last Edited: 16-JAN-2013 12:26

Bit Size inches	Depth From feet	Depth To feet
7.875	850.00	5400.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	850.00	24.00

REMARKS

- SOFTWARE ISSUE: WLS 13.04.8492.
- MCG, MML, MDN, MPD, MFE, MAI RAN IN COMBINATION.
  - HARDWARE: DUAL BOWSPRING USED ON MDN.
  0.5 INCH STANDOFF USED ON MFE.
  0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY.
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
- TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 2134 CU. FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH CASING FROM TD TO 2300 FT: 578 CU. FT.
- SERVICE ORDER # 3537806

- RIG: MURFIN #25.

- ENGINEER: A. SILL.

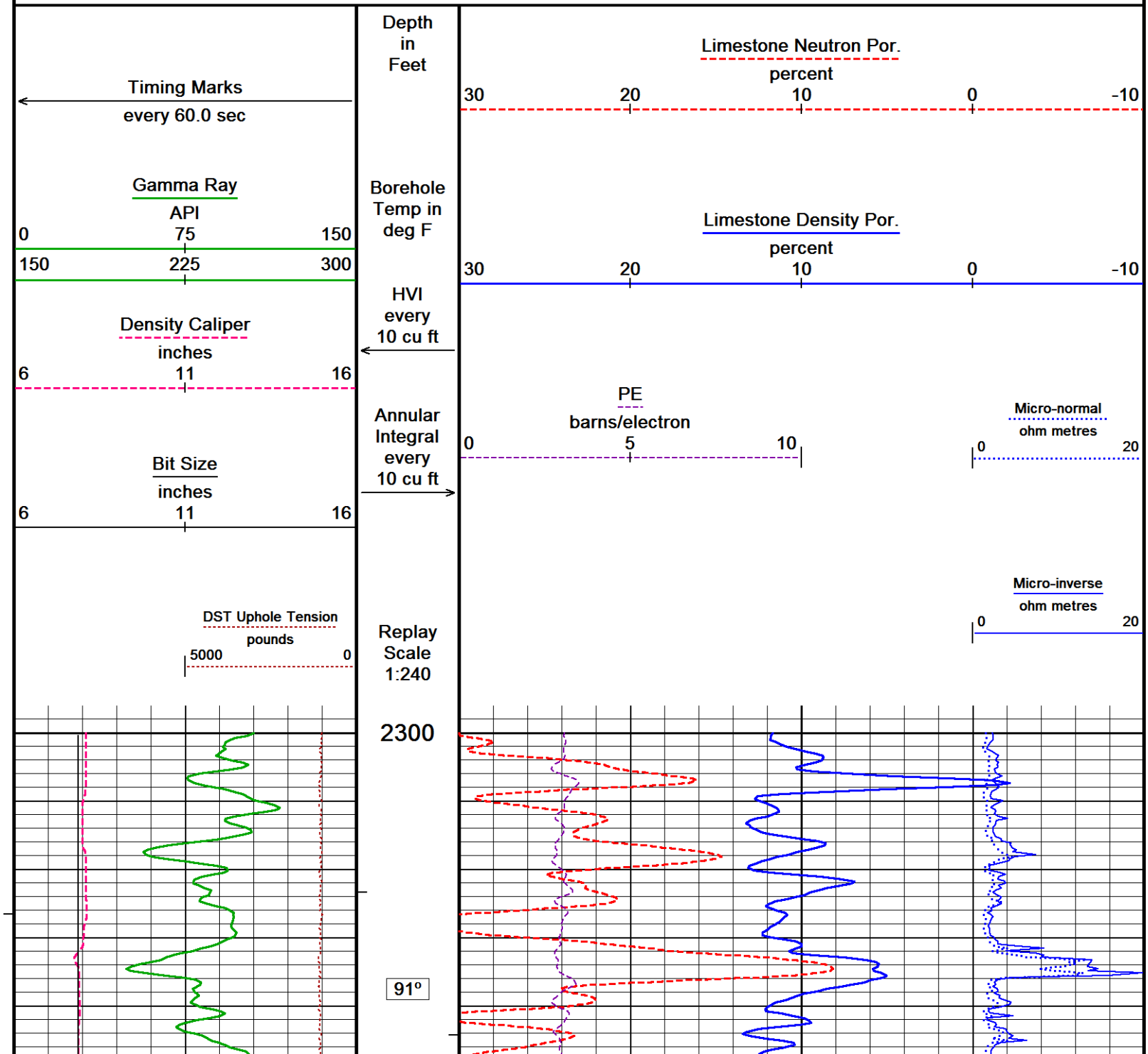
- OPERATOR(S): B. JOHNSON.

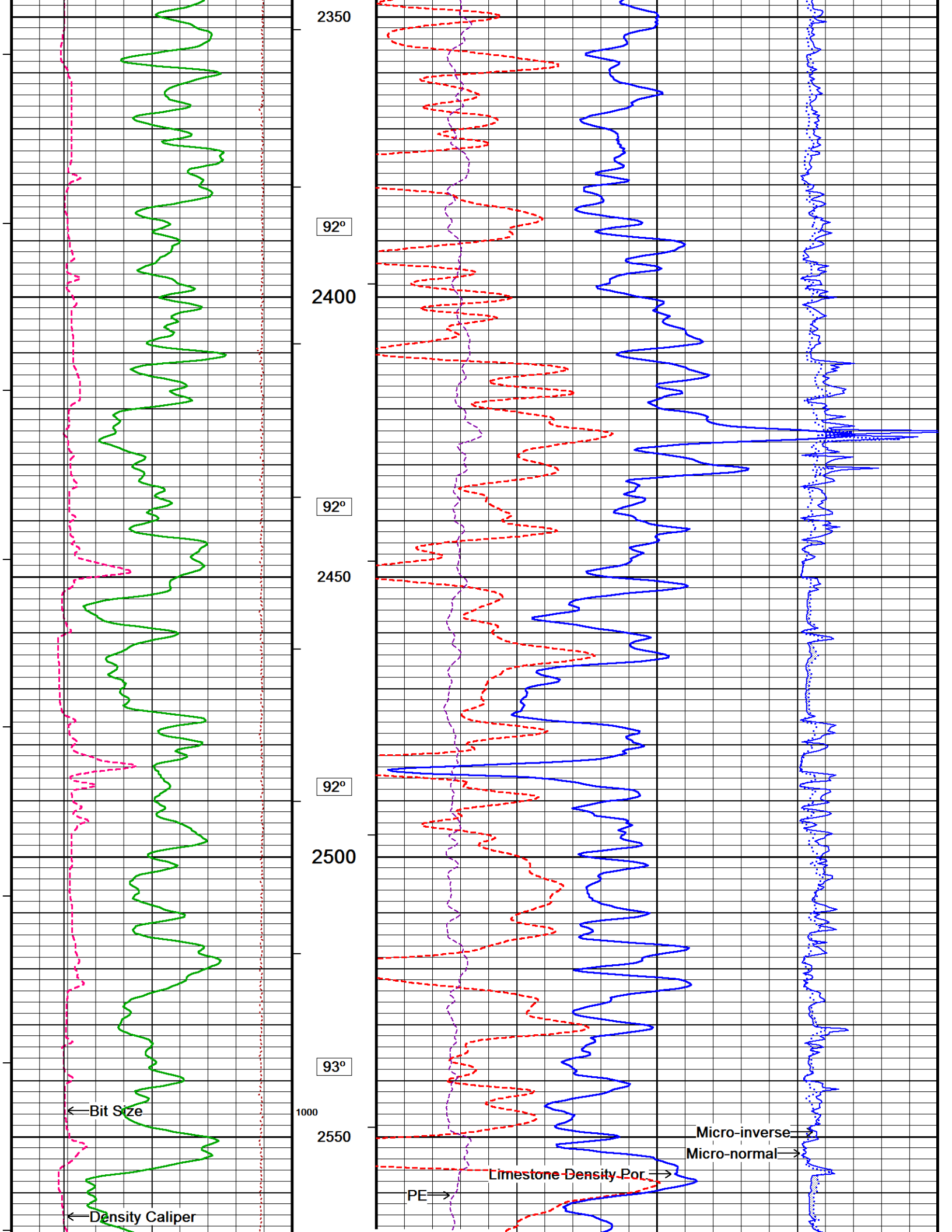
**** SOFTWARE ISSUE CHANGED FLUID LOSS TO MATCH THE PH, FLUID LOSS SHOULD BE 9.6 ML/30MIN. ****

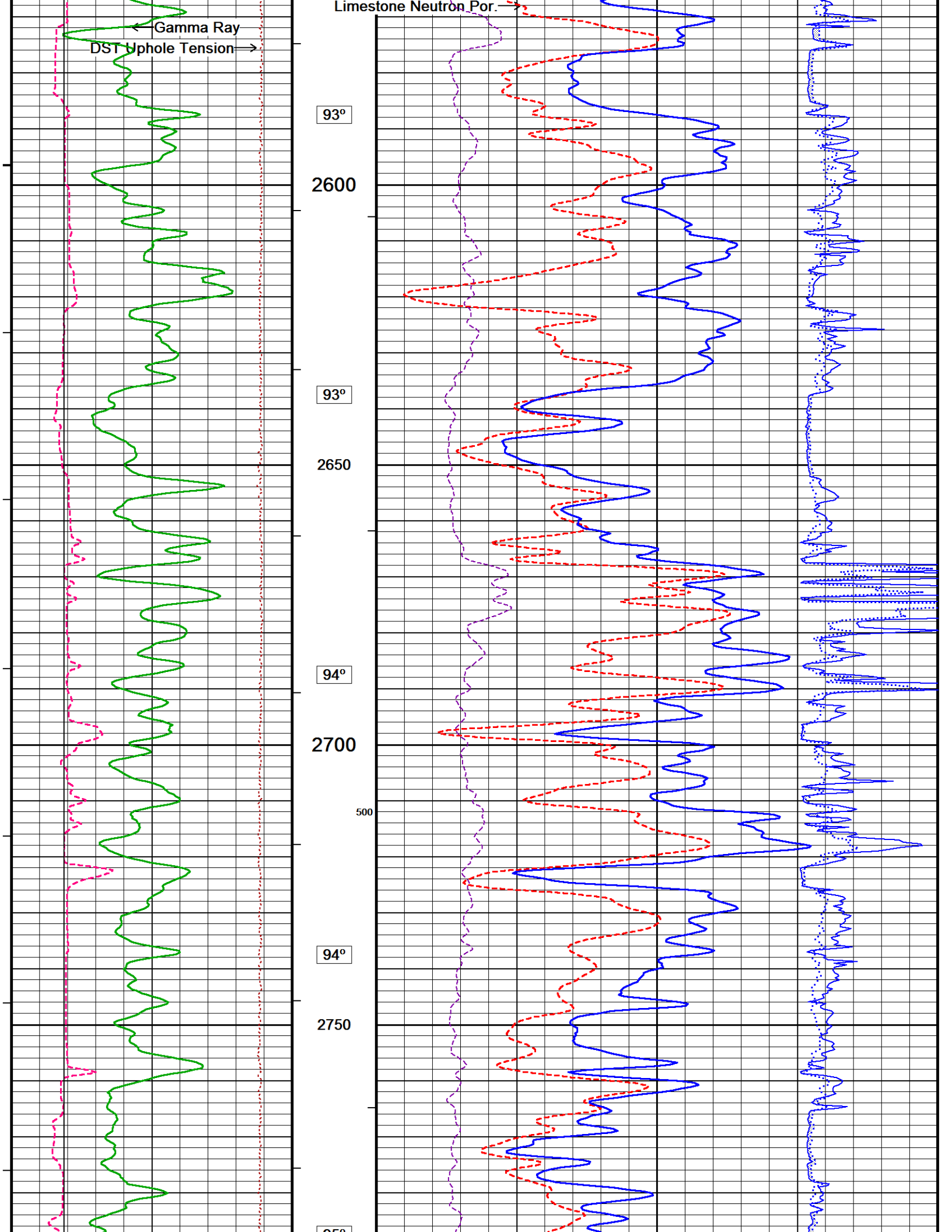
All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions in our price schedule.

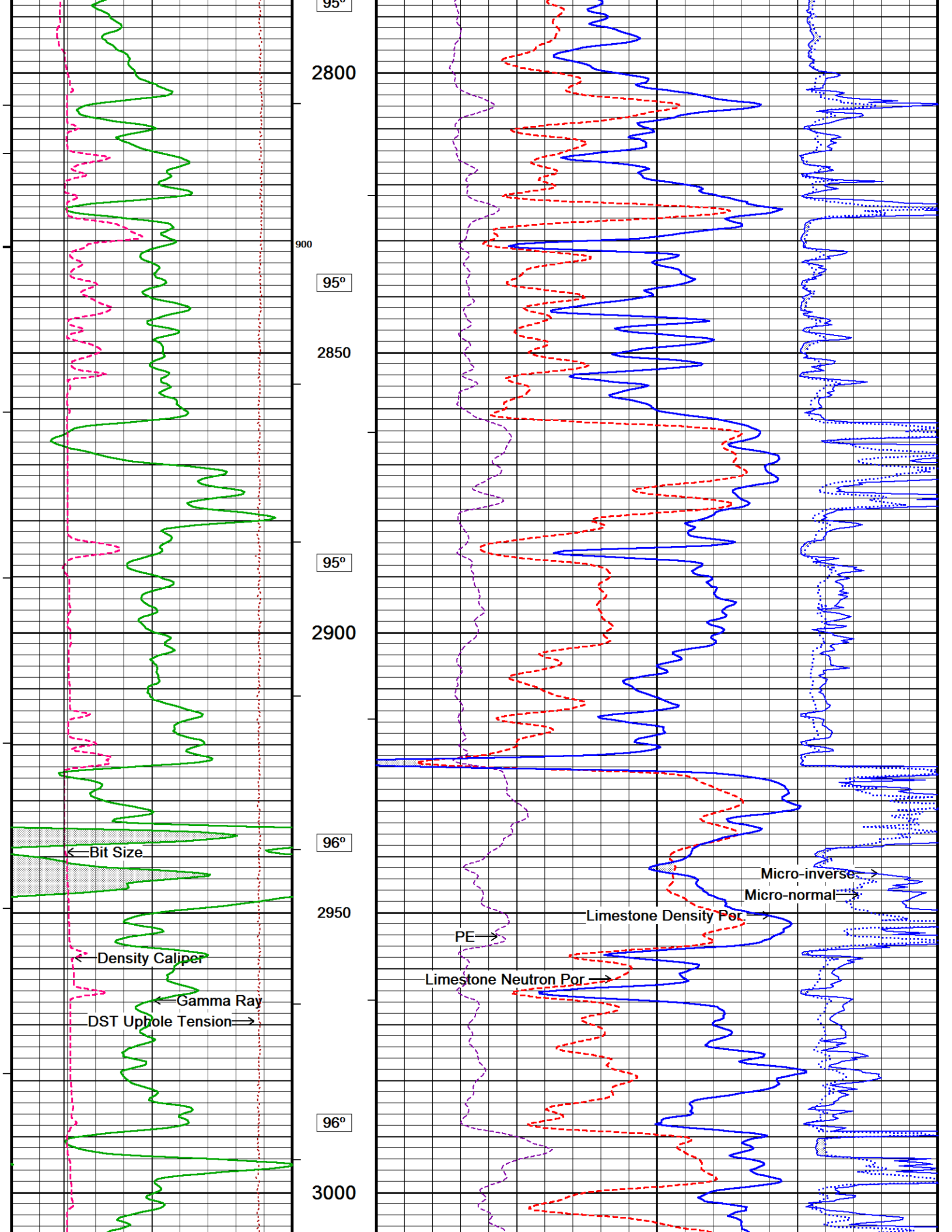
5 INCH MAIN

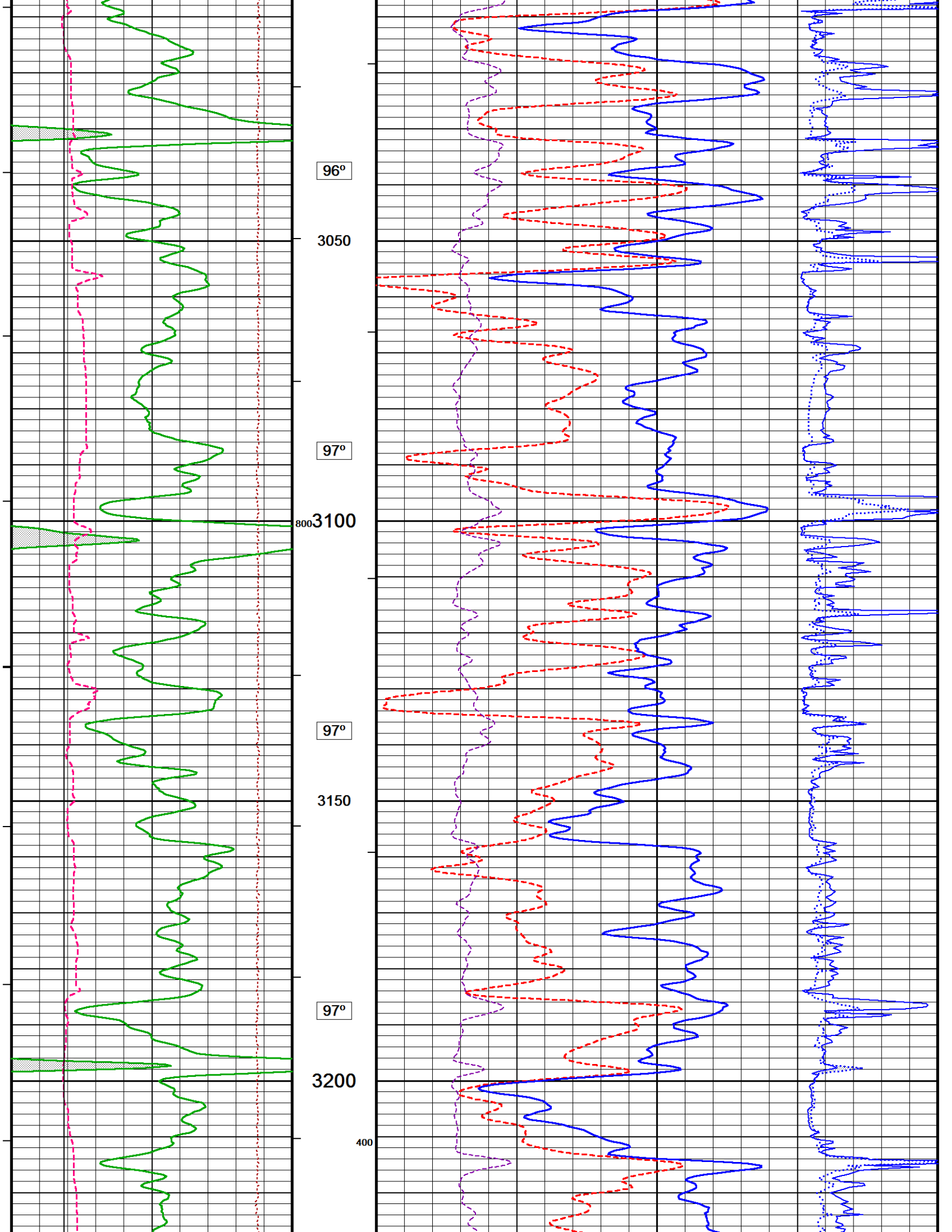
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 18-JAN-2013 08:56
Filename: C:\Users\E143235\AppData\Local\Temp\Weatherford...\Western Operating Fox #1-8_002.dta — Recorded on 16-JAN-2013 14:37
System Versions: Logged with 13.04.8492 Plotted with 13.05.8506

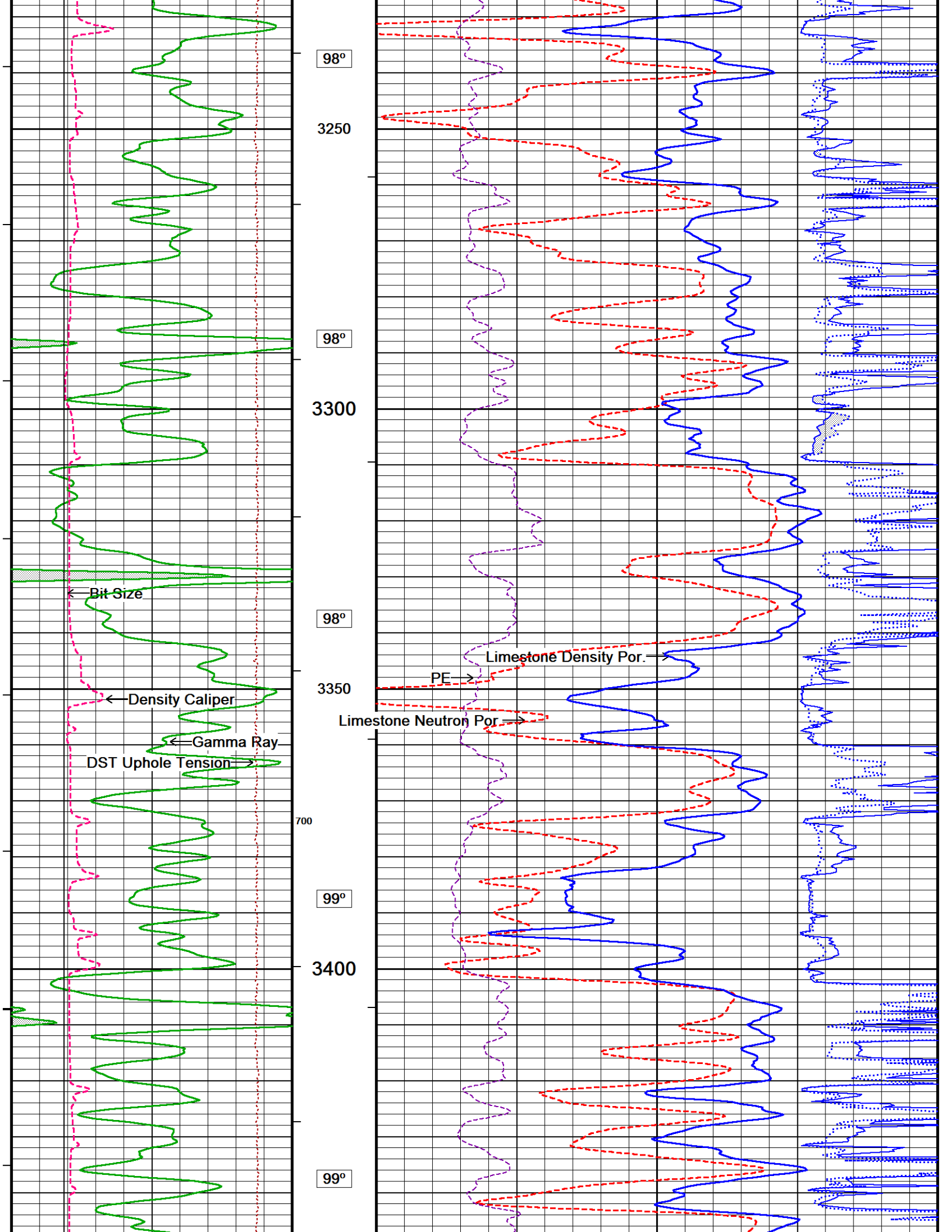


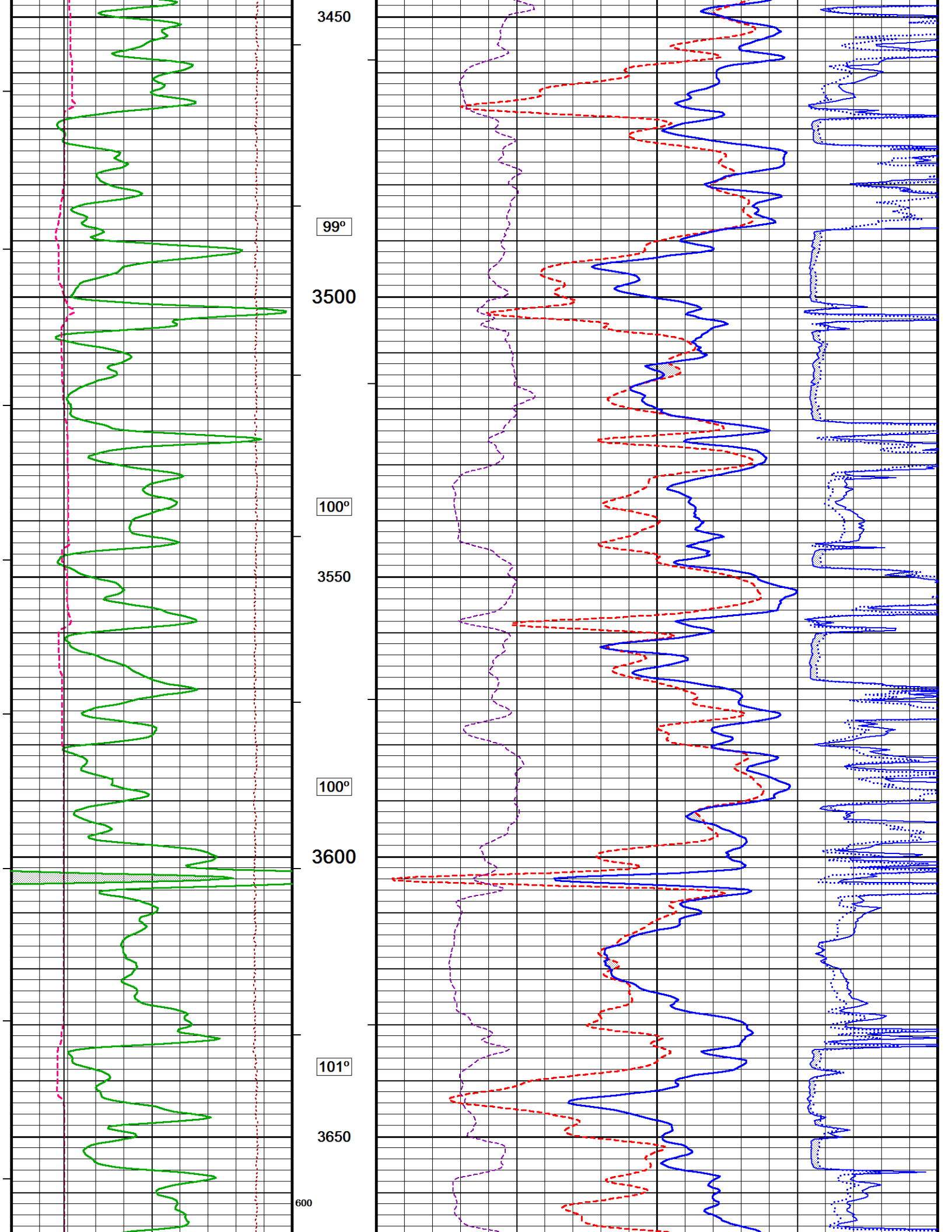

2350
92º
2400
92º
2450
92º
2500
93º
1000
2550
←Bit Size
←Density Caliper
Micro-inverse→
Micro-normal→
Limestone Density Por→
PE→

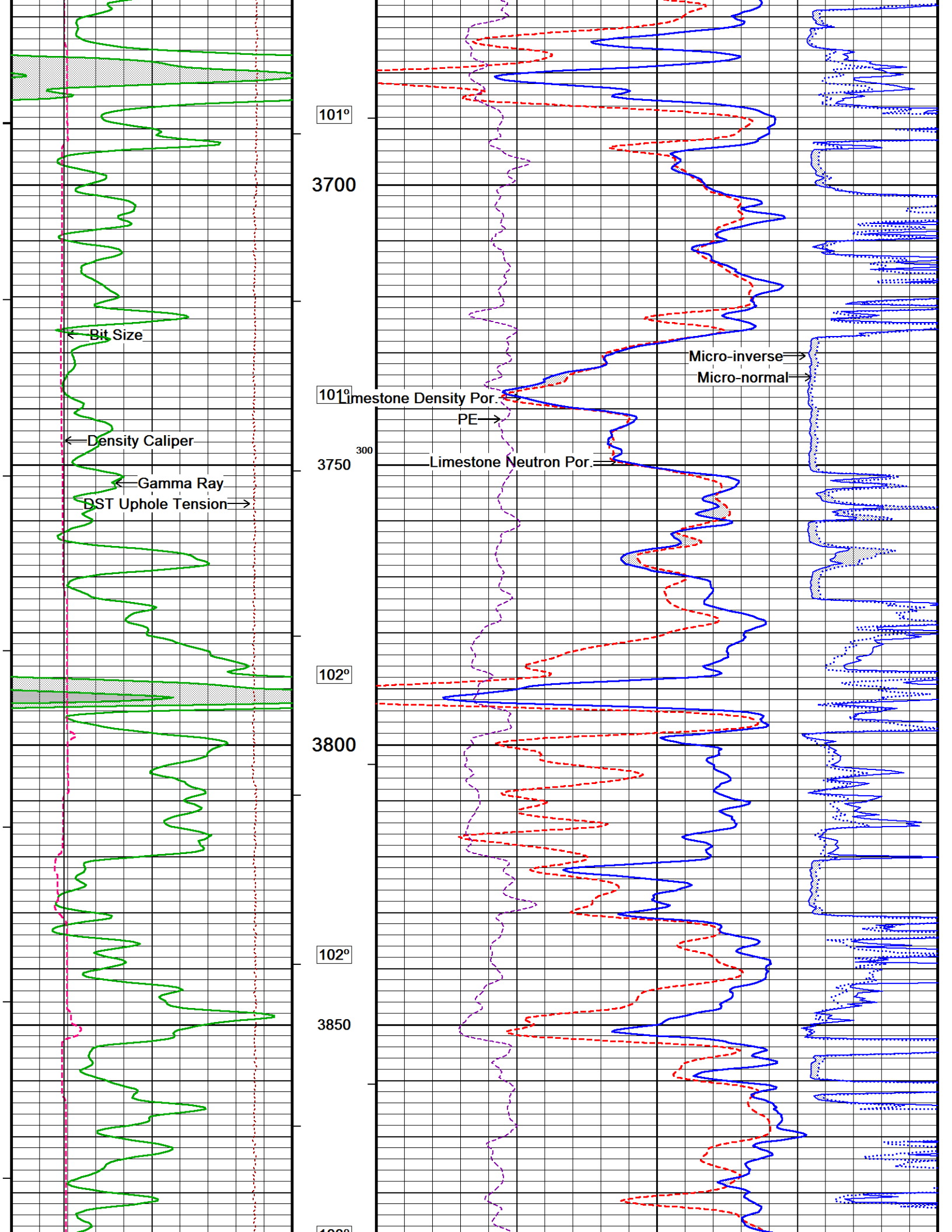

Limestone Neutron Por.
Gamma Ray
DST Uphole Tension
93°
2600
93°
2650
94°
2700
500
94°
2750

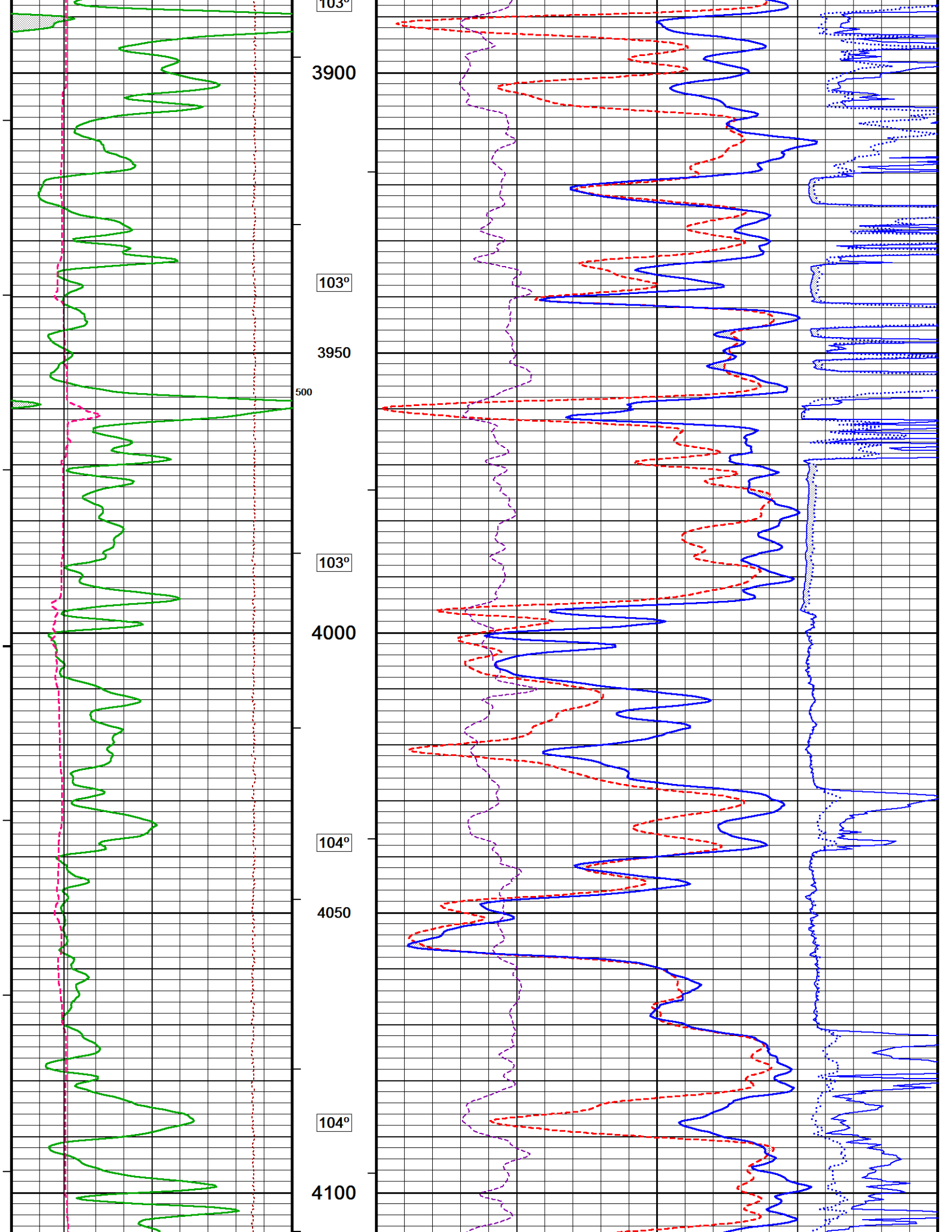

95°
2800
900
95°
2850
95°
2900
96°
2950
96°
3000
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
PE
Limestone Neutron Por
Limestone Density Por
Micro-inverse
Micro-normal

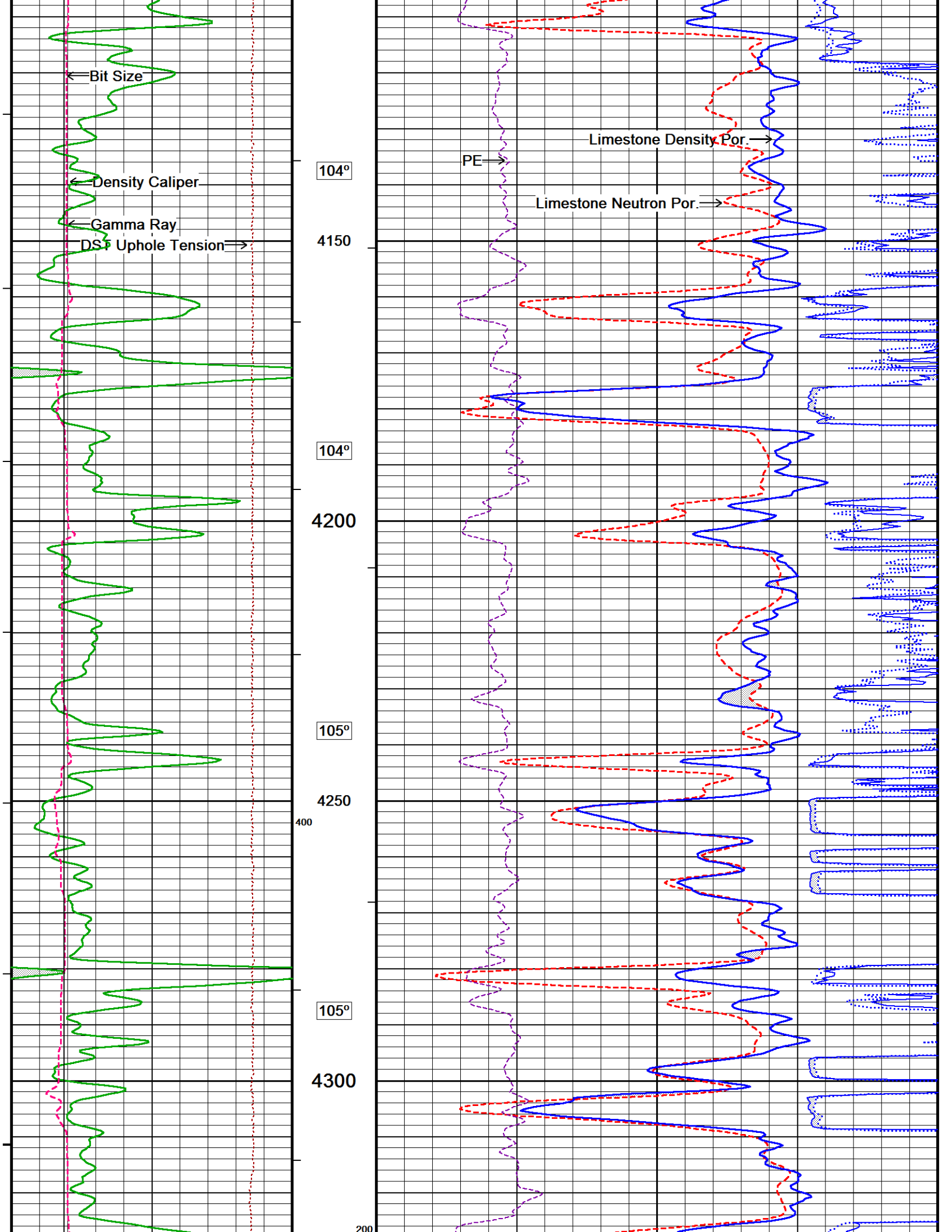

96°
3050
97°
800
3100
97°
3150
97°
3200
400

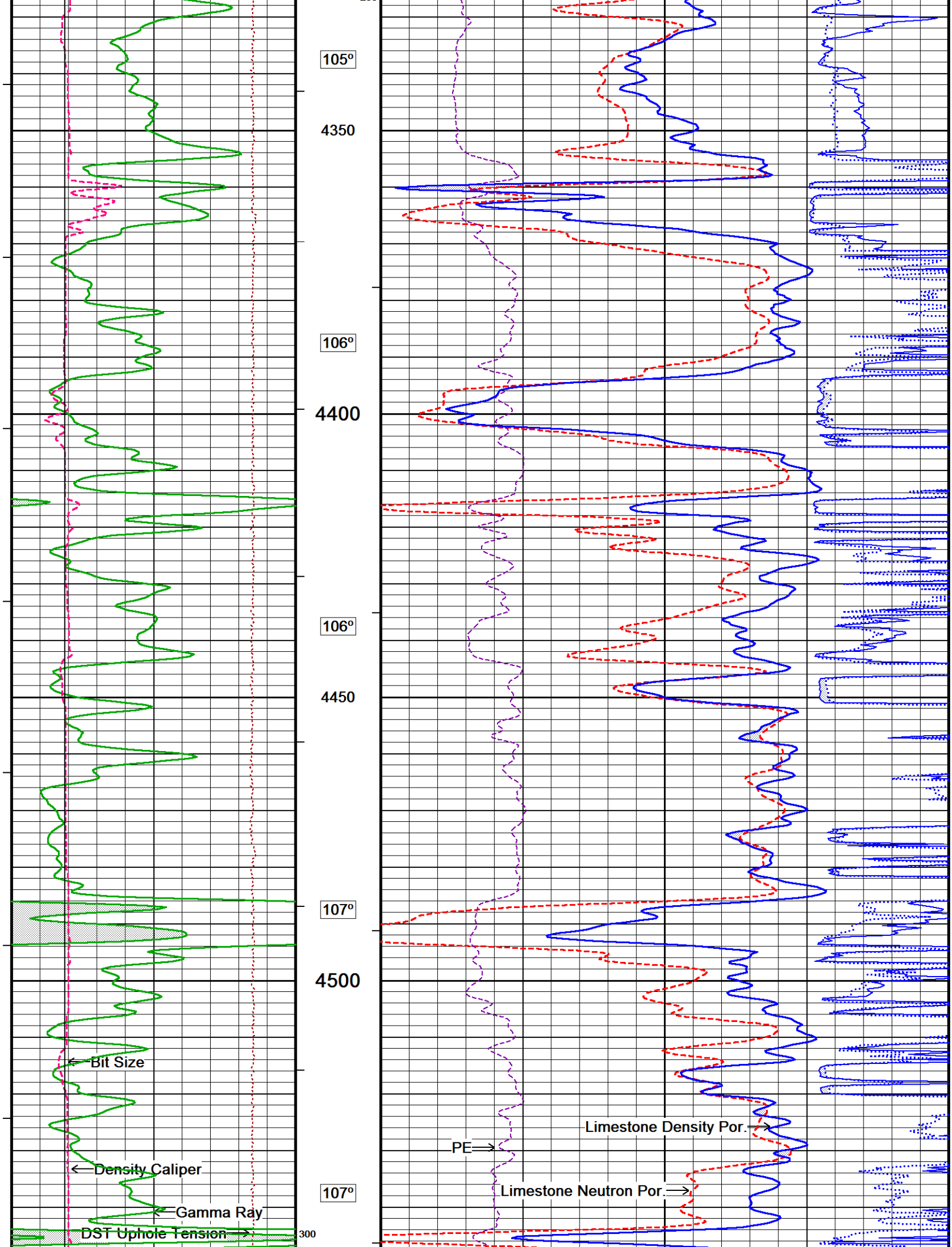

98°
3250
98°
3300
98°
3350
99°
3400
99°
700
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
Limestone Density Por.
PE
Limestone Neutron Por.

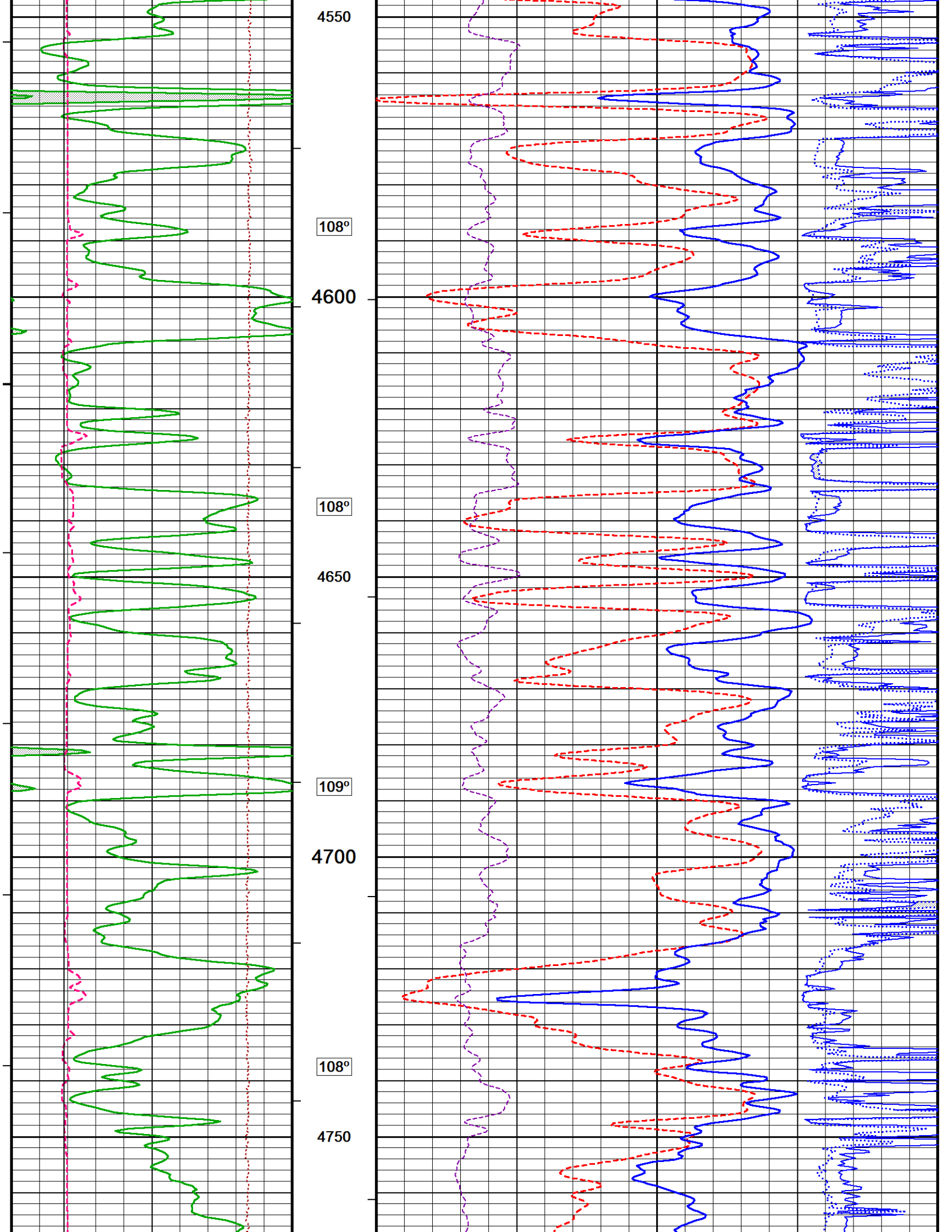

3450
99°
3500
100°
3550
100°
3600
101°
3650
600

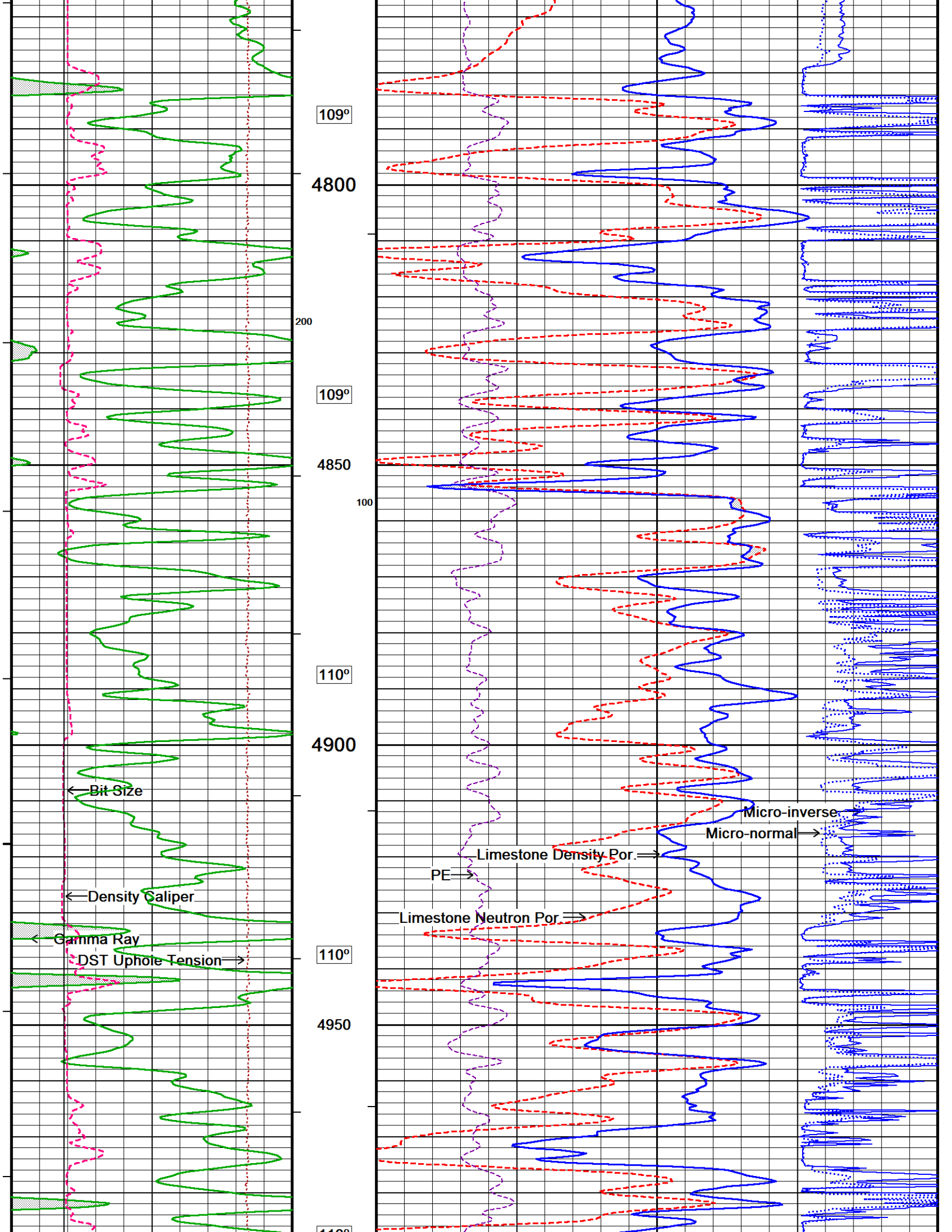

101°
3700
Bit Size
Micro-inverse
Micro-normal
101°
Limestone Density Por.
PE
Density Caliper
300
3750
Limestone Neutron Por.
Gamma Ray
DST Uphole Tension
102°
3800
102°
3850

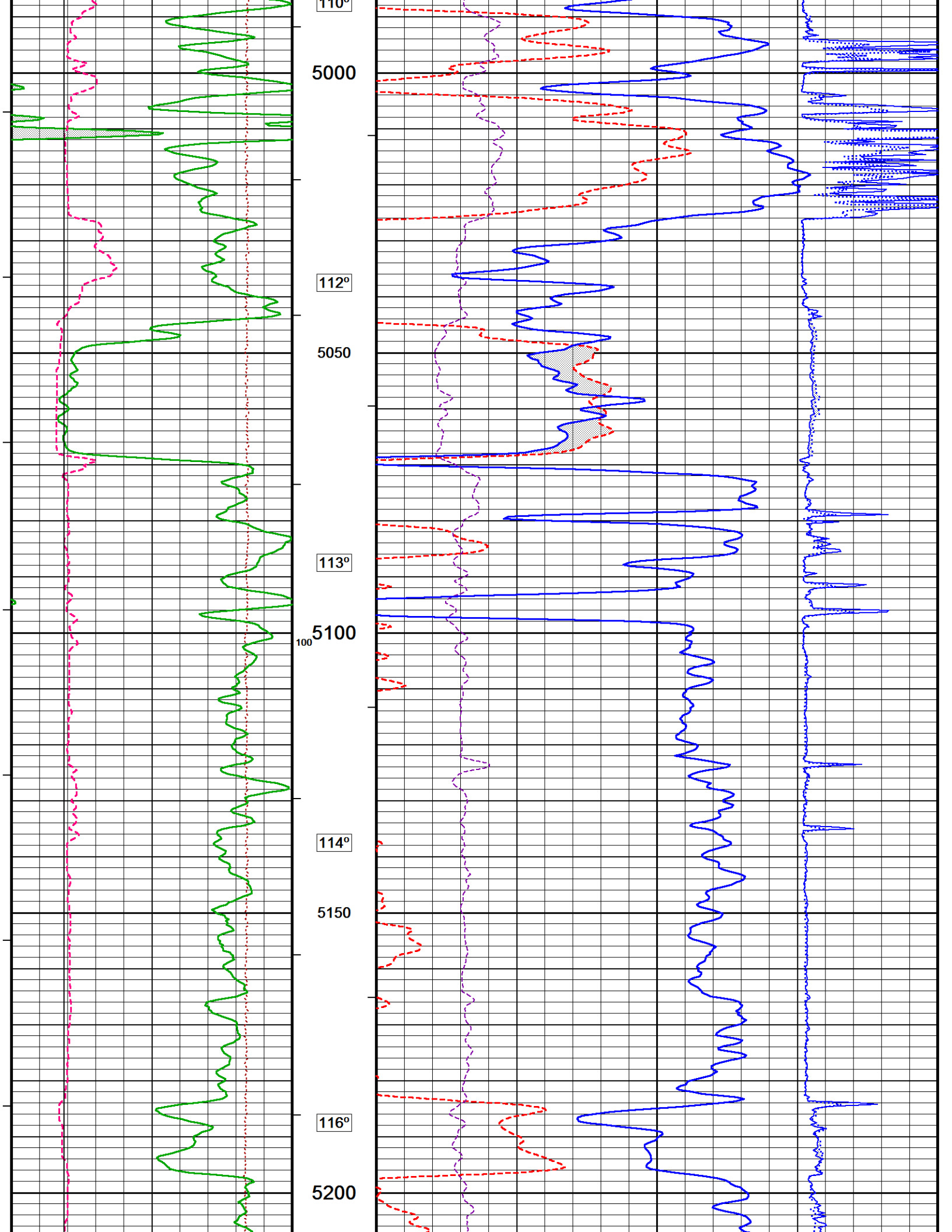

103°
3900
103°
3950
500
103°
4000
104°
4050
104°
4100

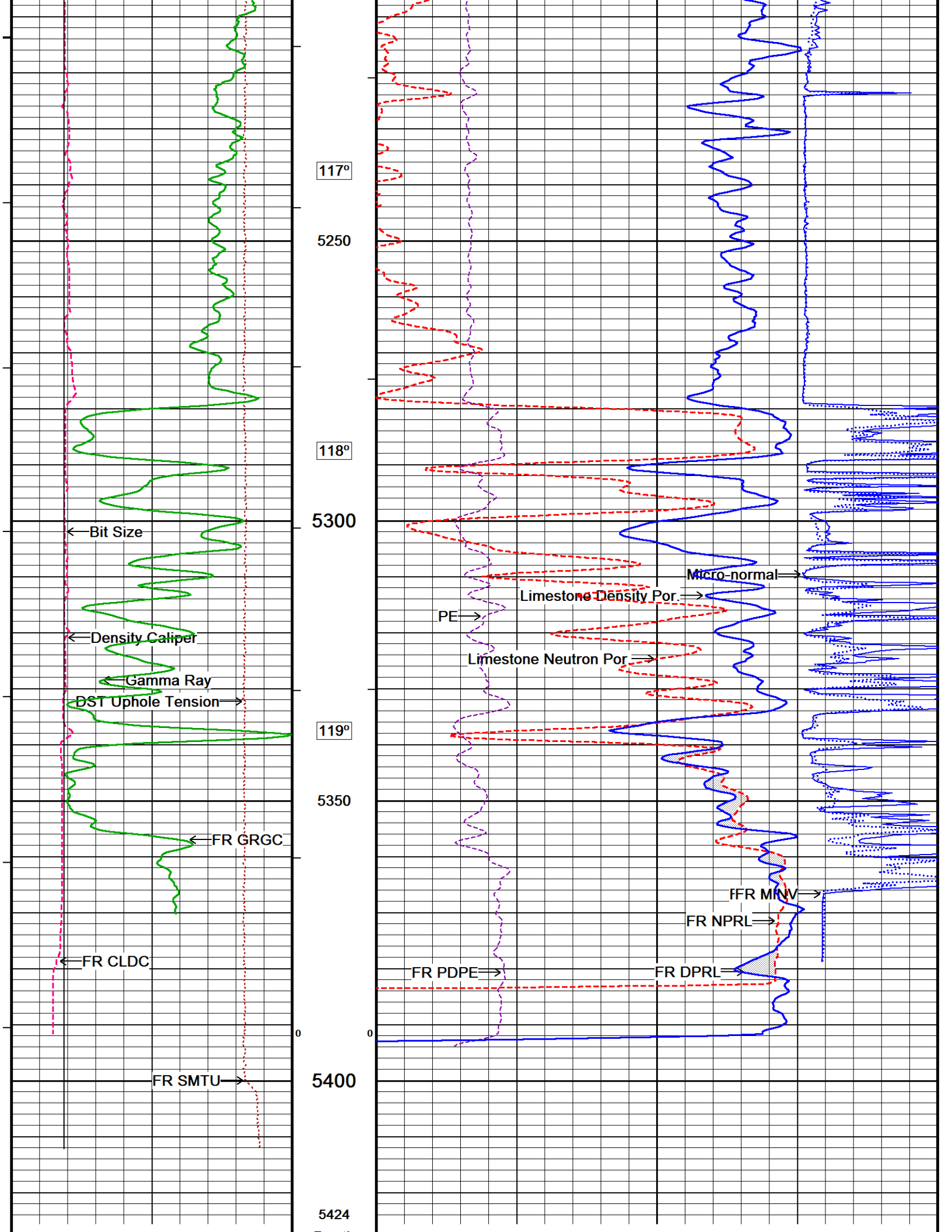

Bit Size
Density Caliper
Gamma Ray
DSI Uphole Tension
PE
Limestone Density Por.
Limestone Neutron Por.
104°
4150
104°
4200
105°
4250
400
105°
4300
200

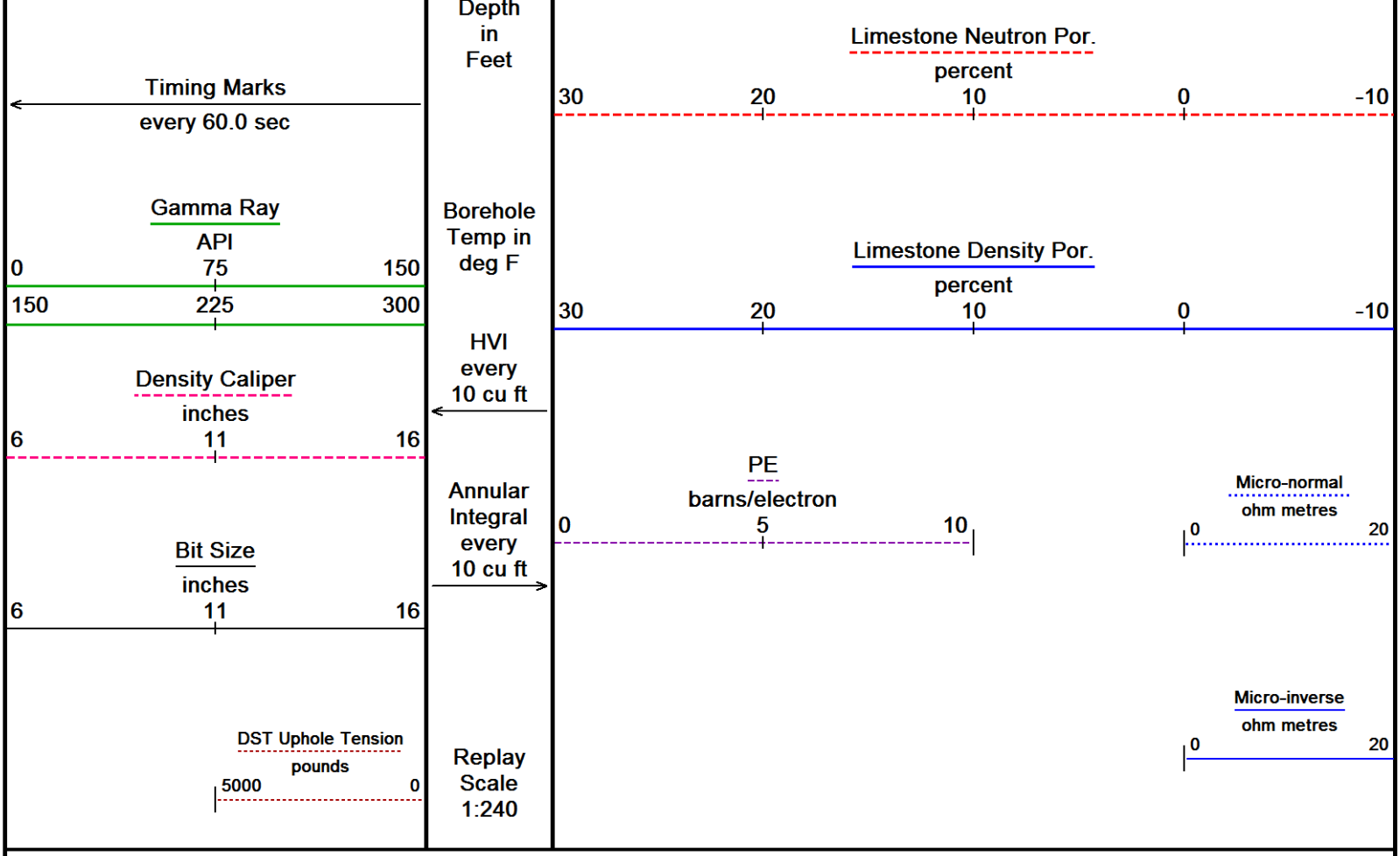

105°
4350
106°
4400
106°
4450
107°
4500
107°
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
300
PE
Limestone Density Por.
Limestone Neutron Por.


4550
108°
4600
108°
4650
109°
4700
108°
4750


109º
4800
200
109º
4850
100
110º
4900
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
110º
4950
Micro-inverse
Micro-normal
Limestone Density Por.
PE
Limestone Neutron Por.


110°
5000
112°
5050
113°
100
5100
114°
5150
116°
5200


117°
5250
118°
5300
119°
5350
5400
5424
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
FR GRGC
FR CLDC
FR SMTU
0
0
Micro-normal
Limestone Density Por
PE
Limestone Neutron Por
FFR MNV
FR NPRL
FR PDPE
FR DPRL



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5 INCH MAIN

REPEAT SECTION

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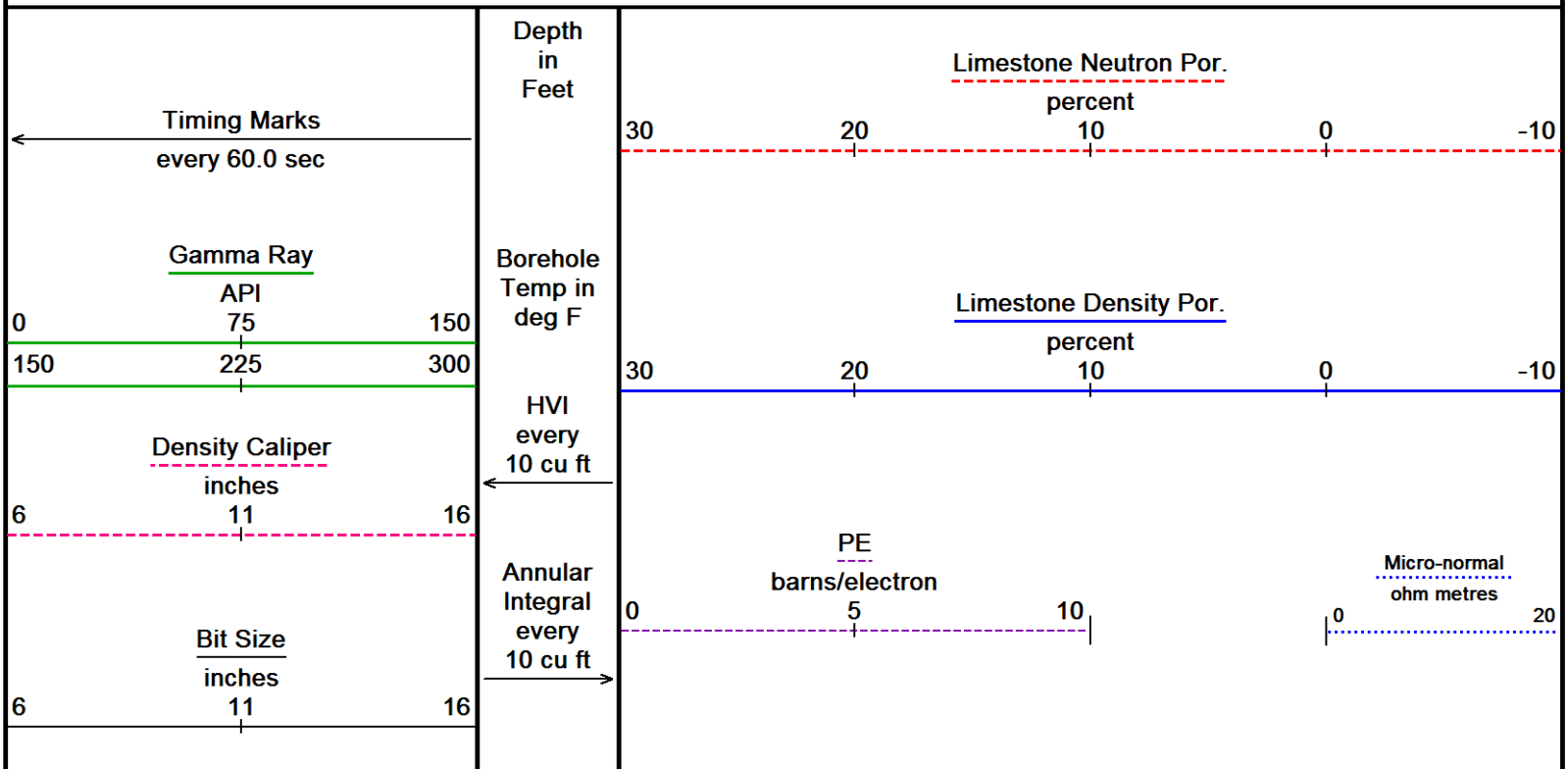
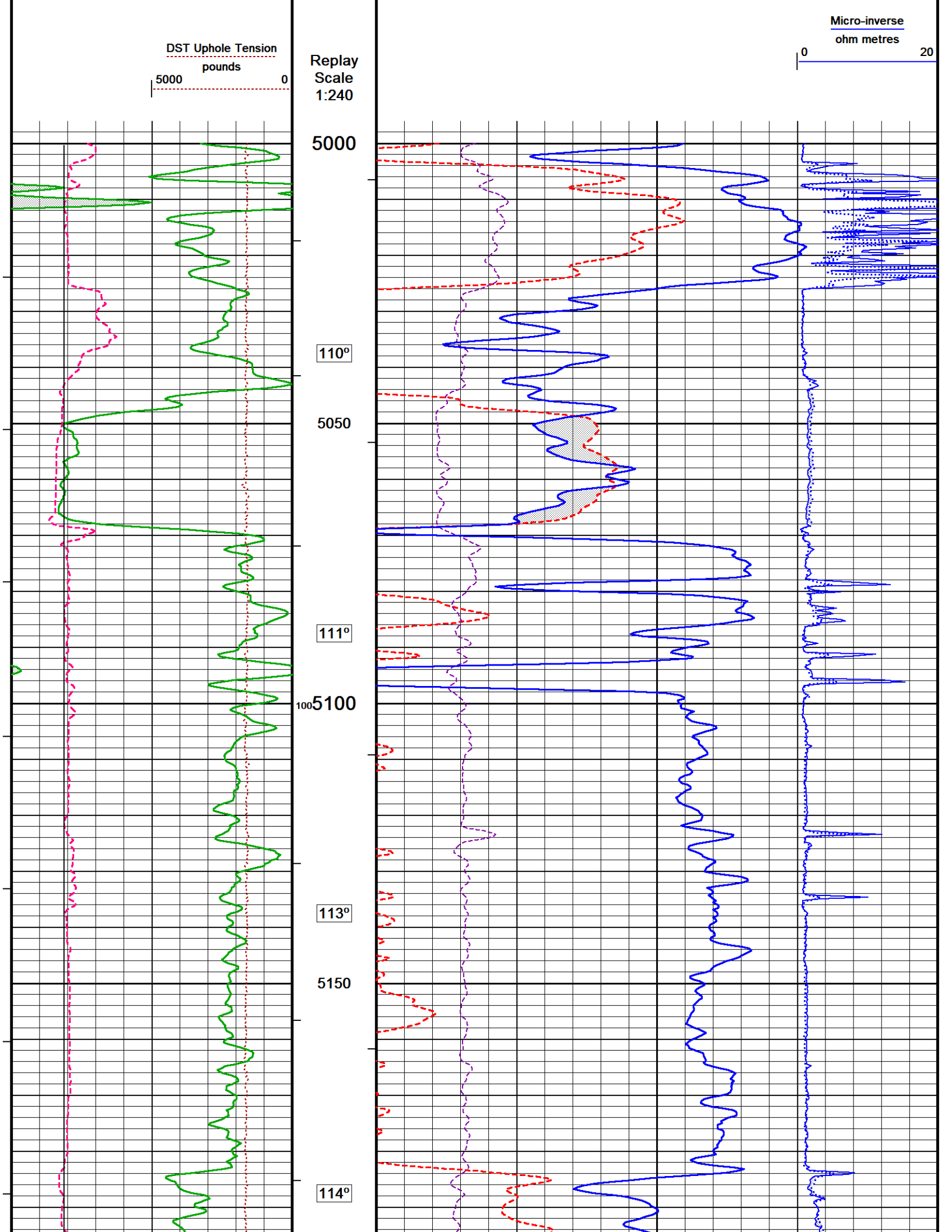
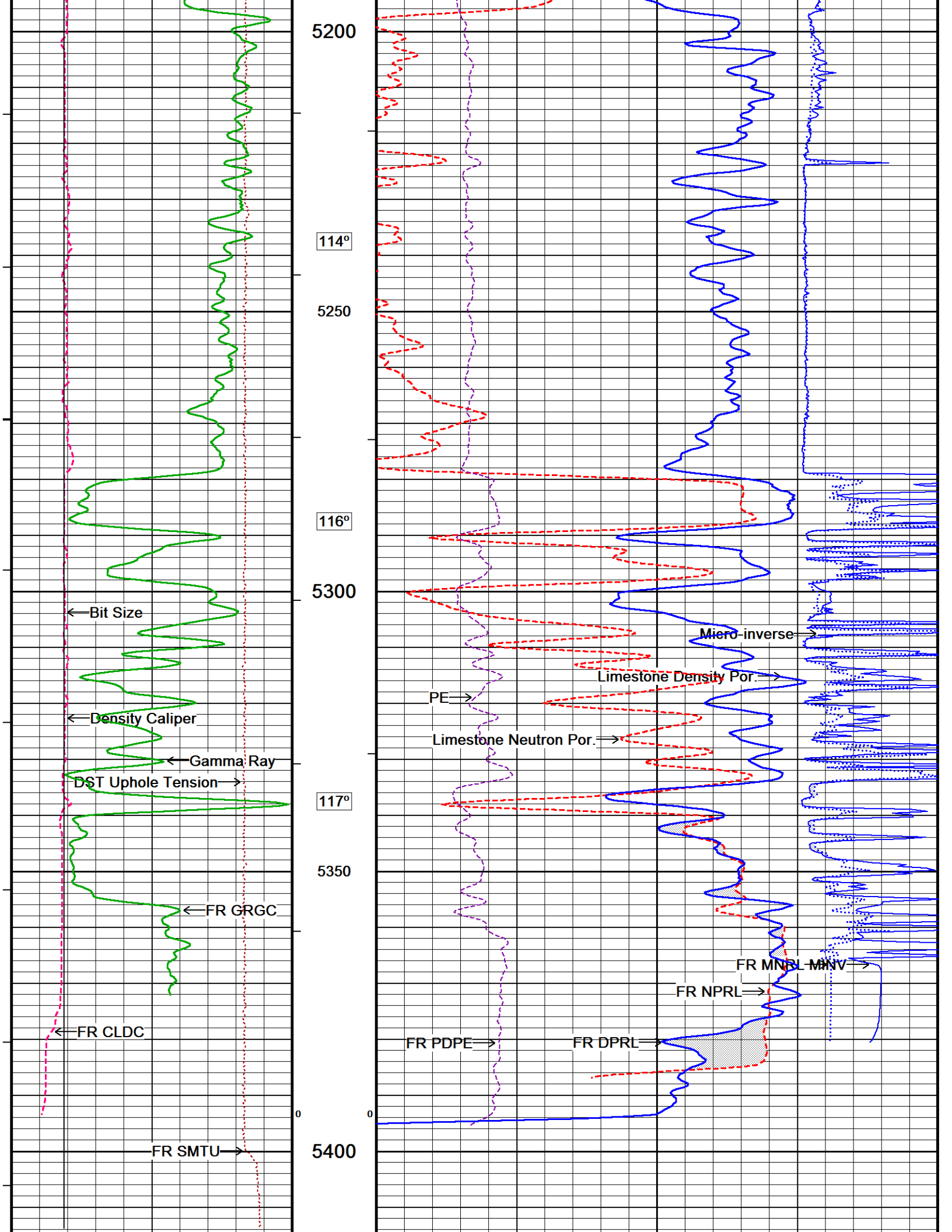
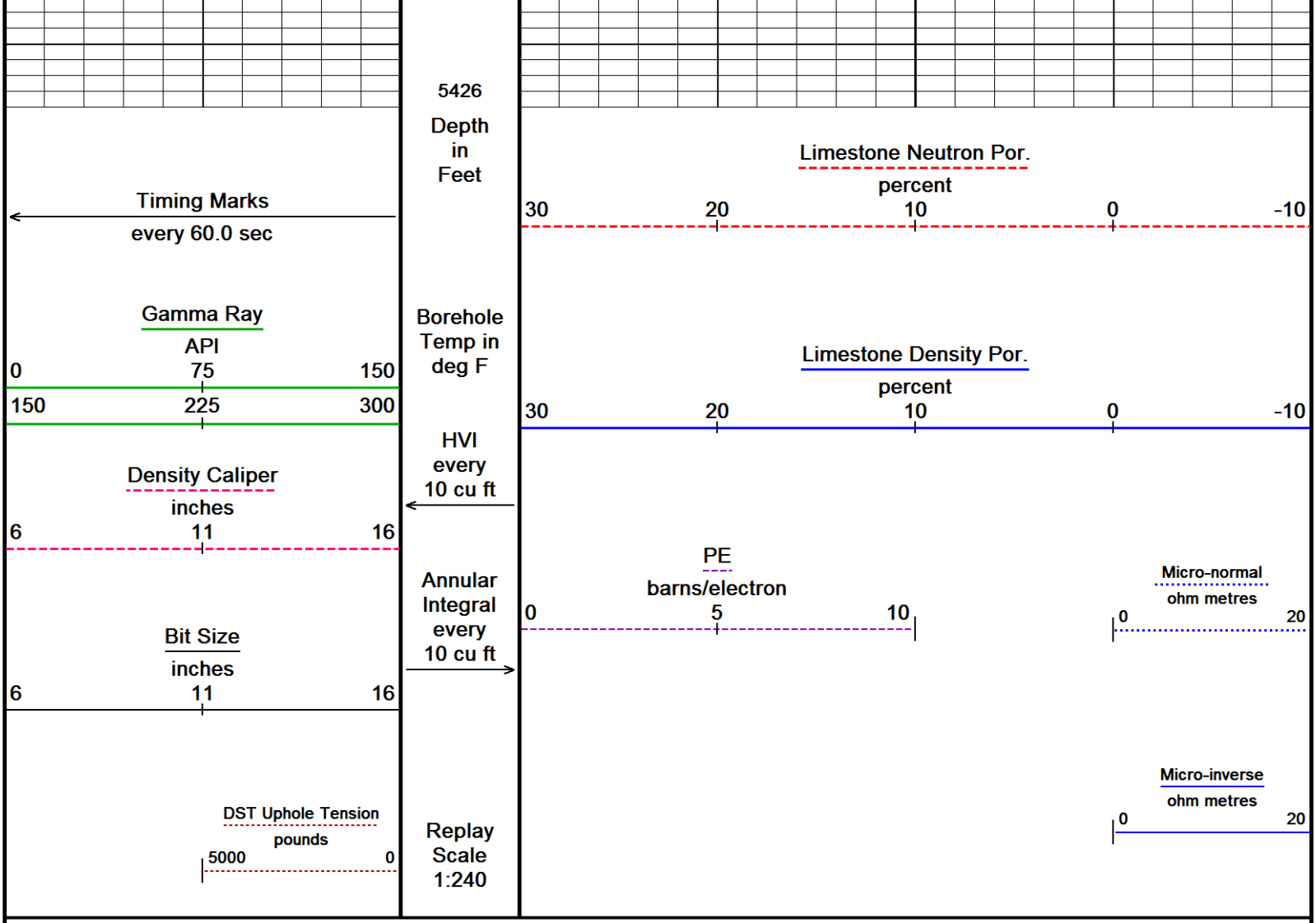



DST Uphole Tension
pounds
5000
0
Replay
Scale
1:240
Micro-inverse
ohm metres
0
20
5000
110°
5050
111°
100
5100
113°
5150
114°


5200
114°
5250
116°
5300
117°
5350
5400
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
FR GRGC
FR CLDC
FR SMTU
0
0
Micro-inverse
Limestone Density Por.
PE
Limestone Neutron Por.
FR MNRL
MINV
FR NPRL
FR PDPE
FR DPRL



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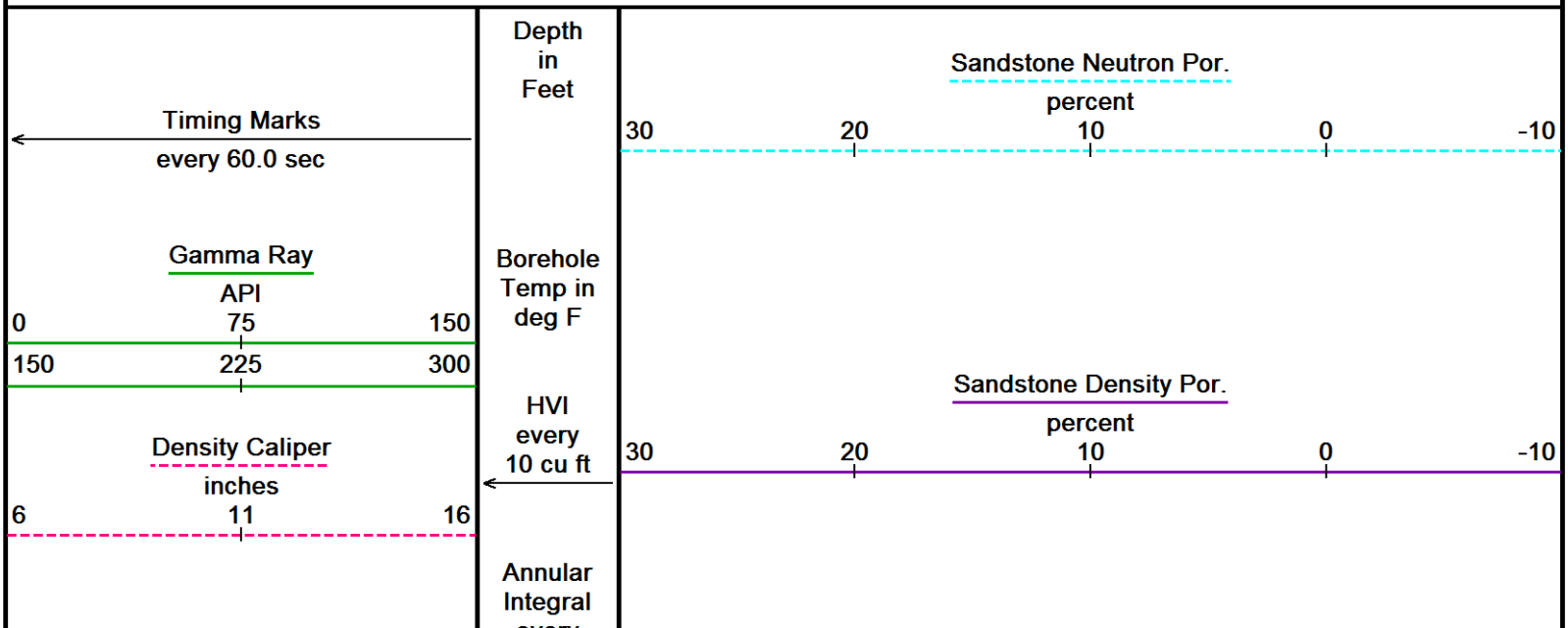
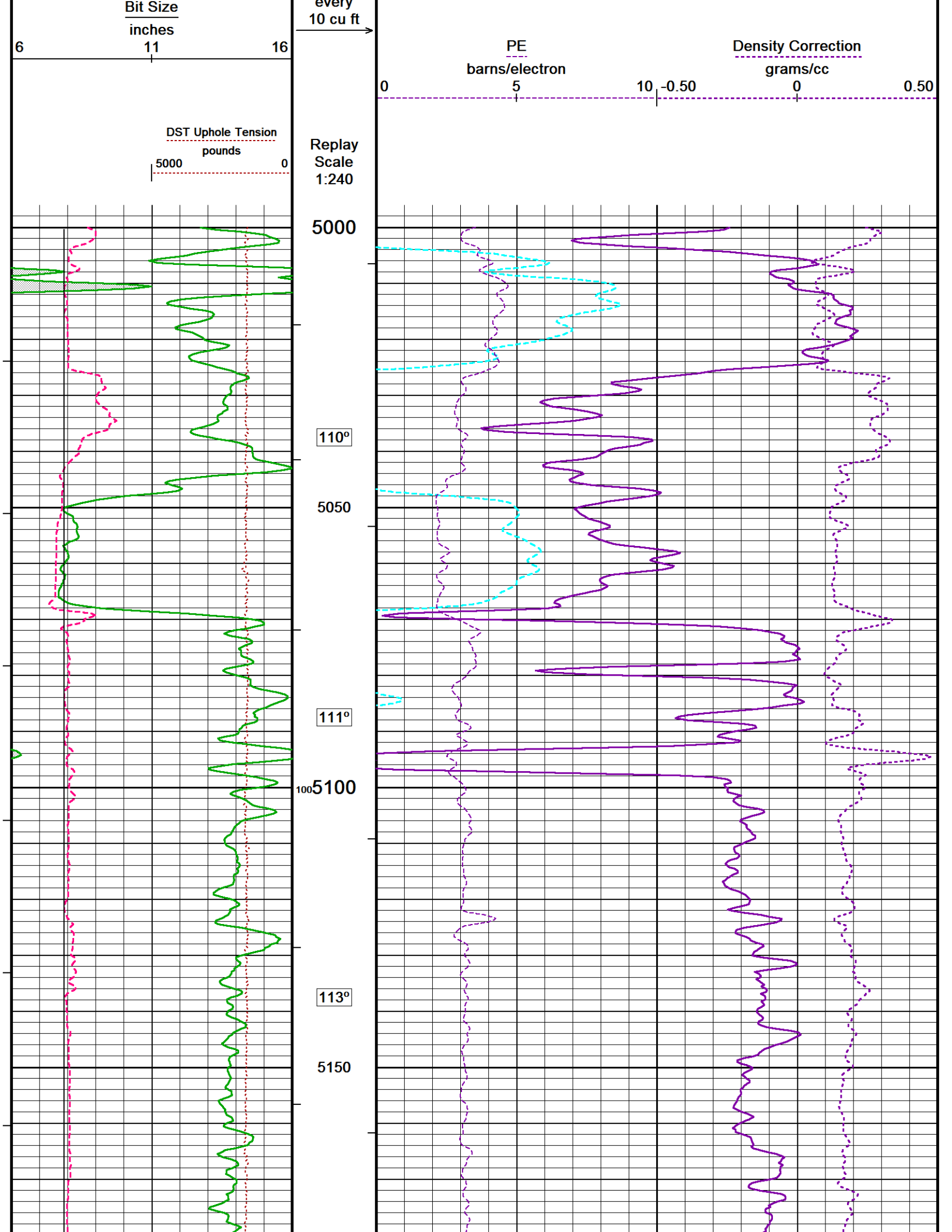
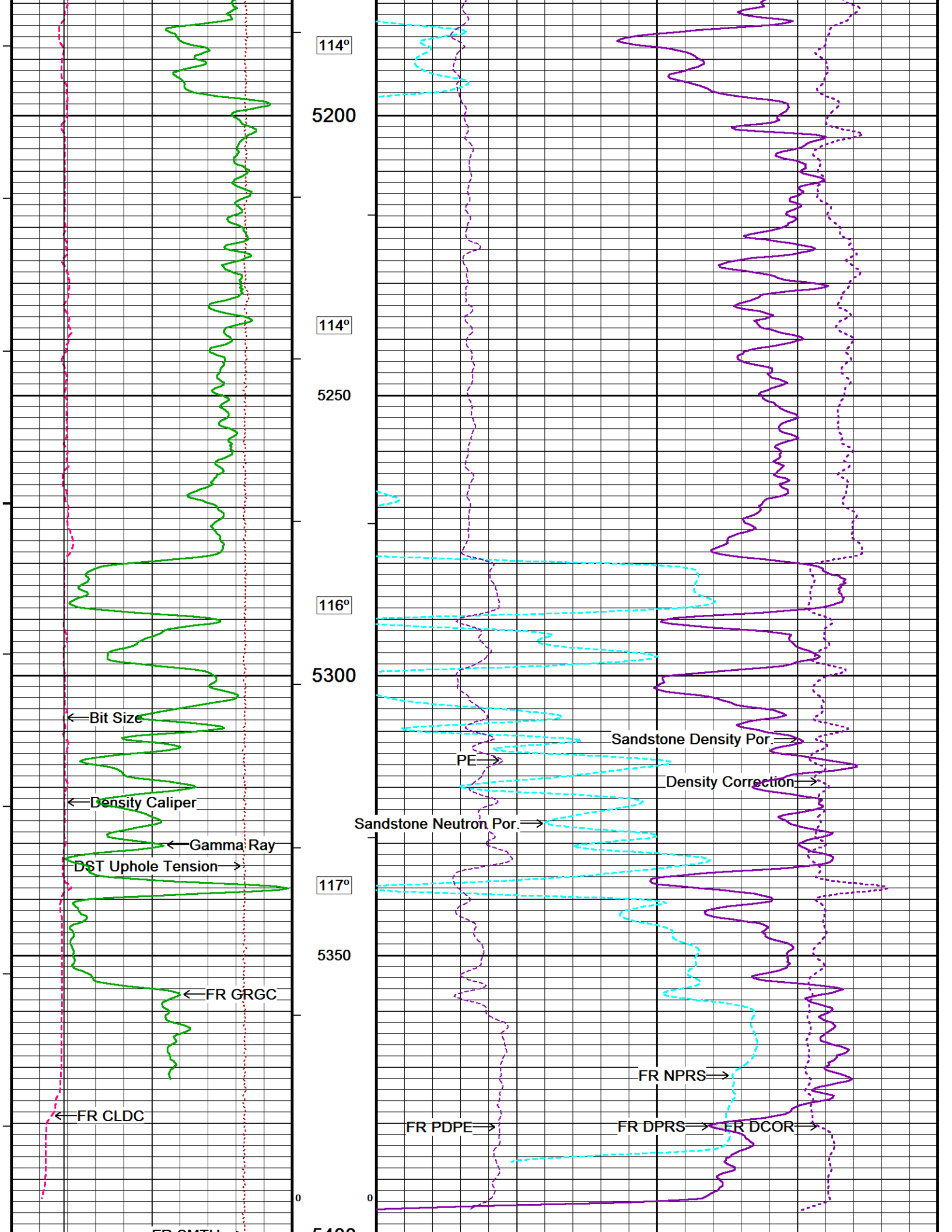
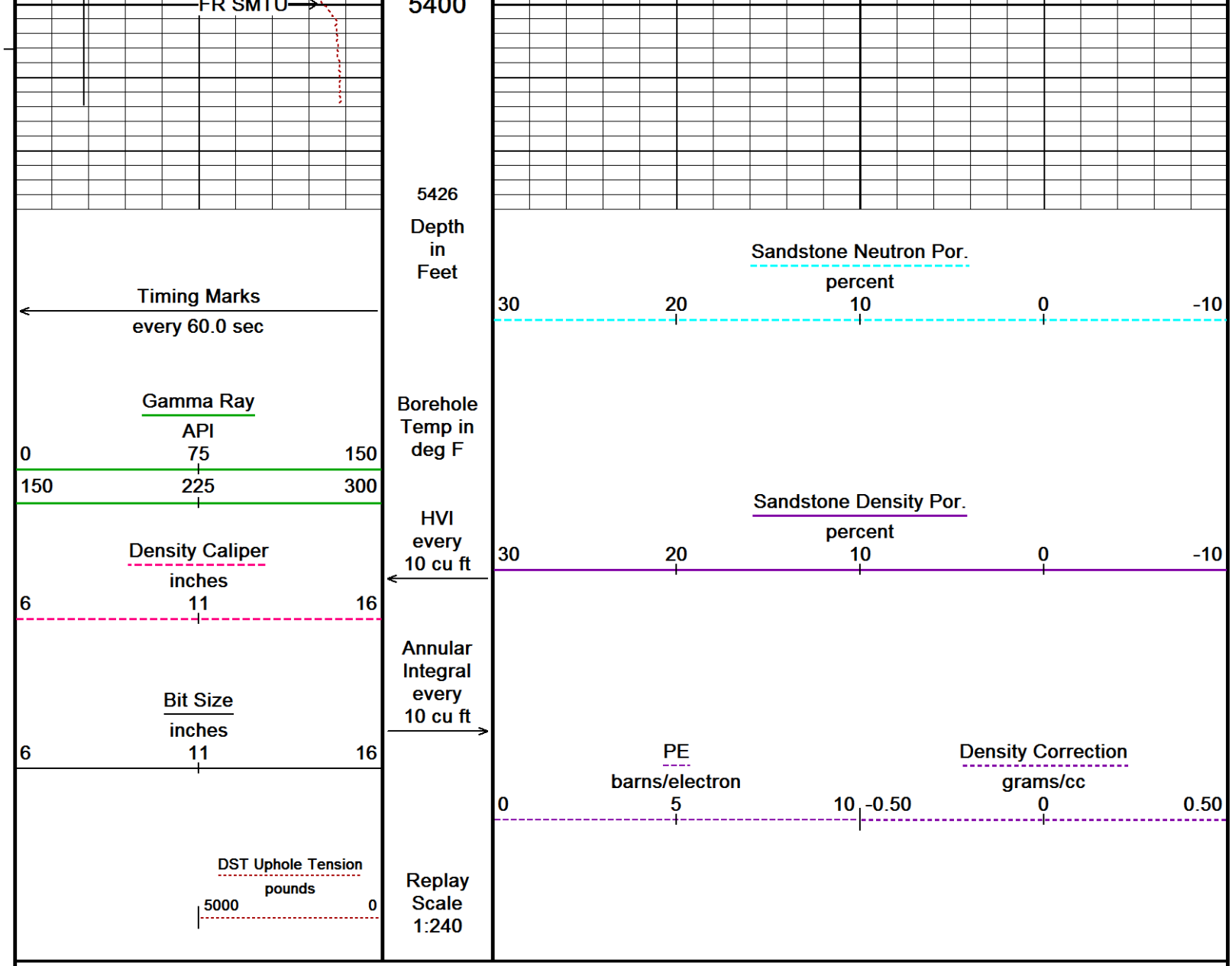



Bit Size
inches
6
11
16
every
10 cu ft
PE
barns/electron
0
5
10
Density Correction
grams/cc
-0.50
0
0.50
DST Uphole Tension
pounds
5000
0
Replay
Scale
1:240
5000
110°
5050
111°
100
5100
113°
5150


114°
5200
114°
5250
116°
5300
117°
5350
0
0
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
FR GRGC
FR CLDC
Sandstone Density Por.
PE
Density Correction
Sandstone Neutron Por.
FR NPRS
FR PDPE
FR DPRS
FR DCOR



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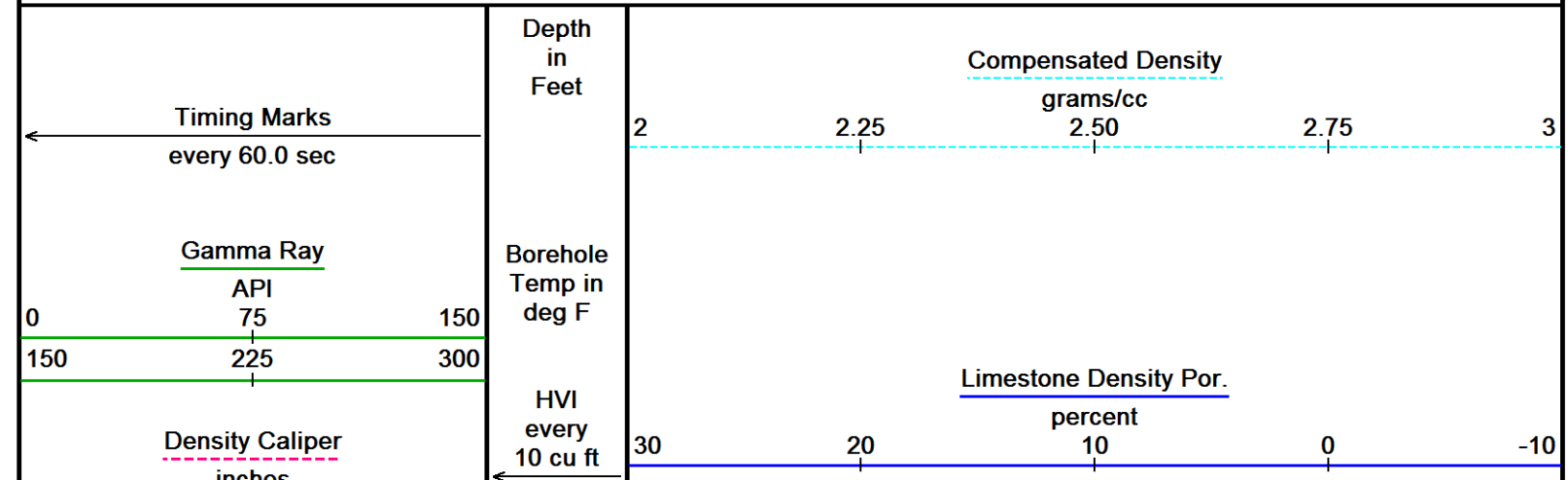
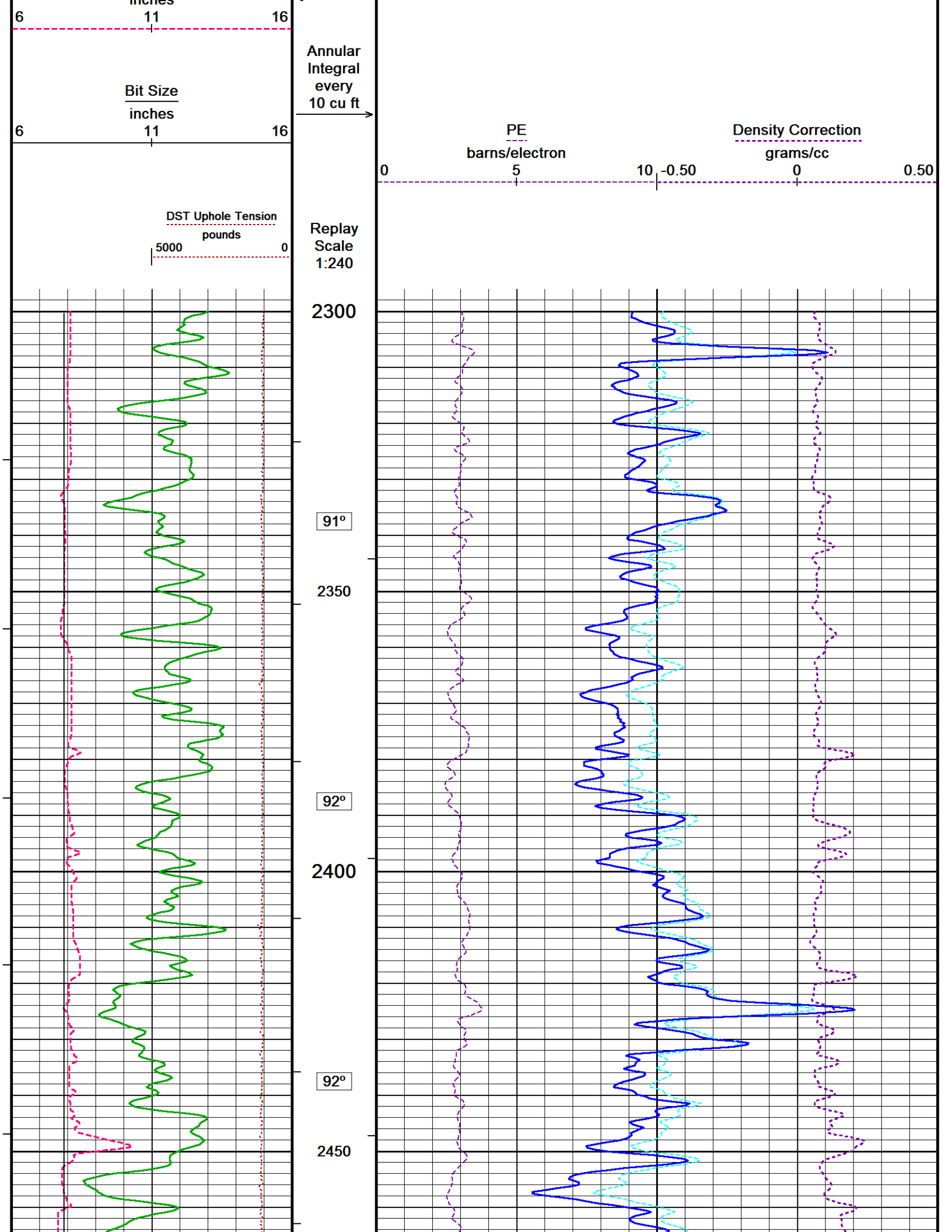
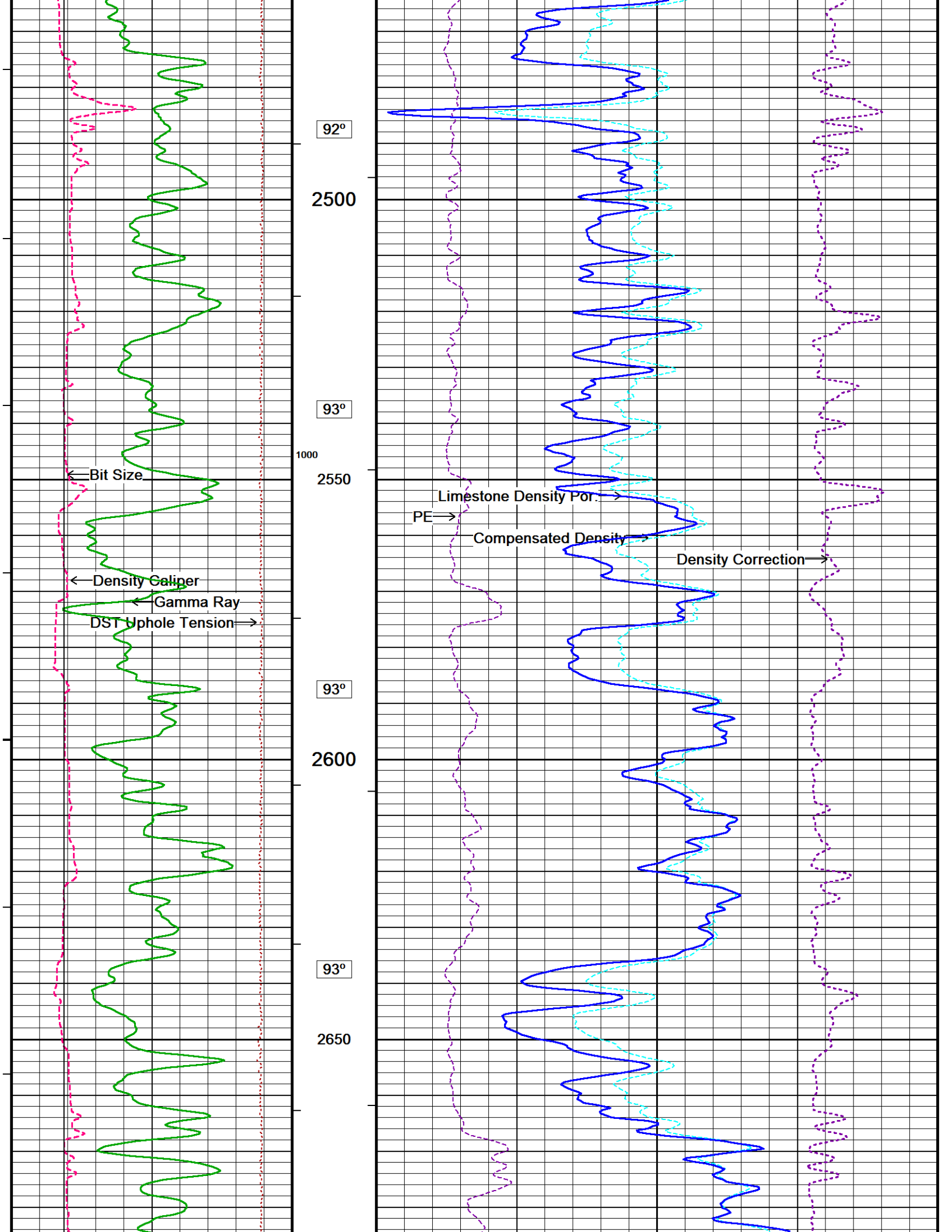
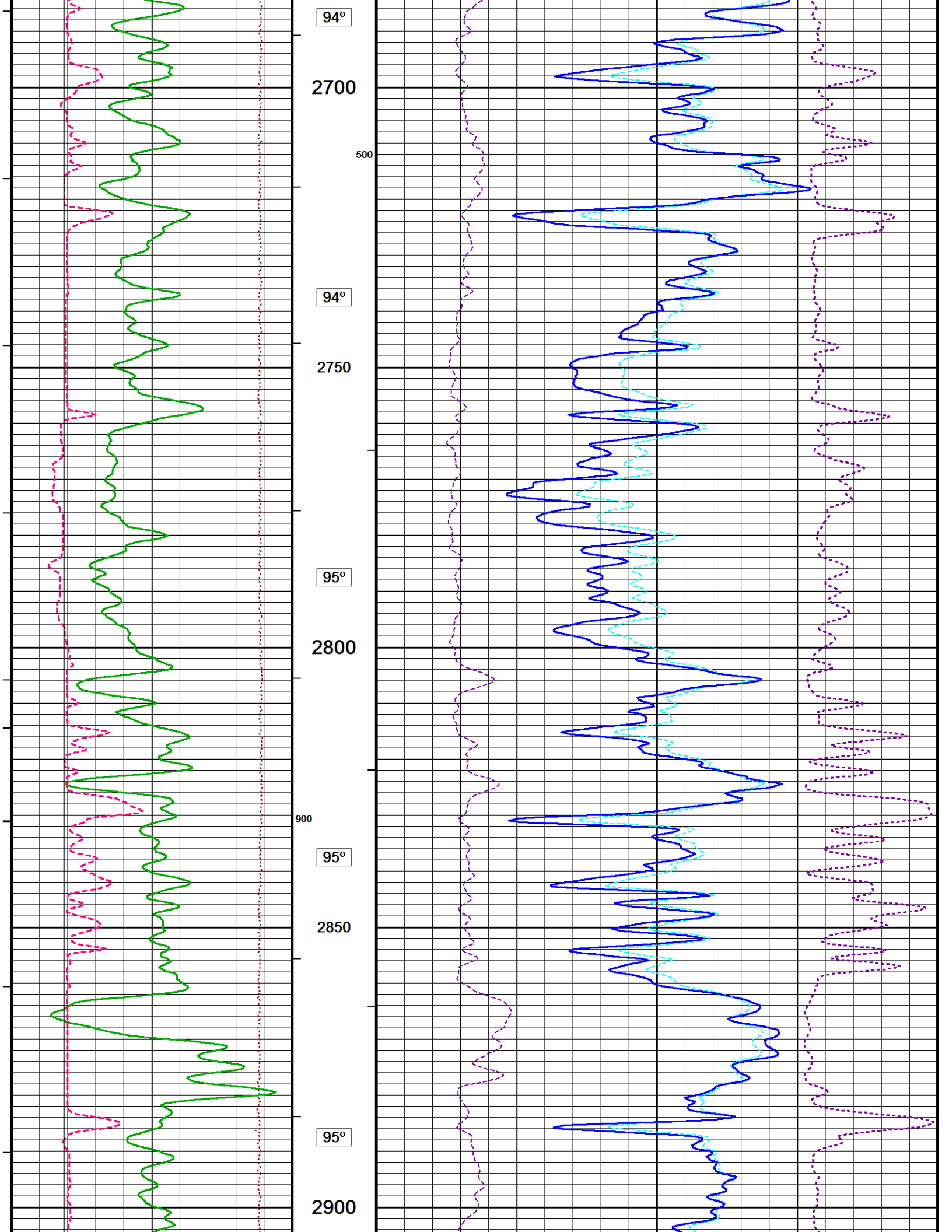
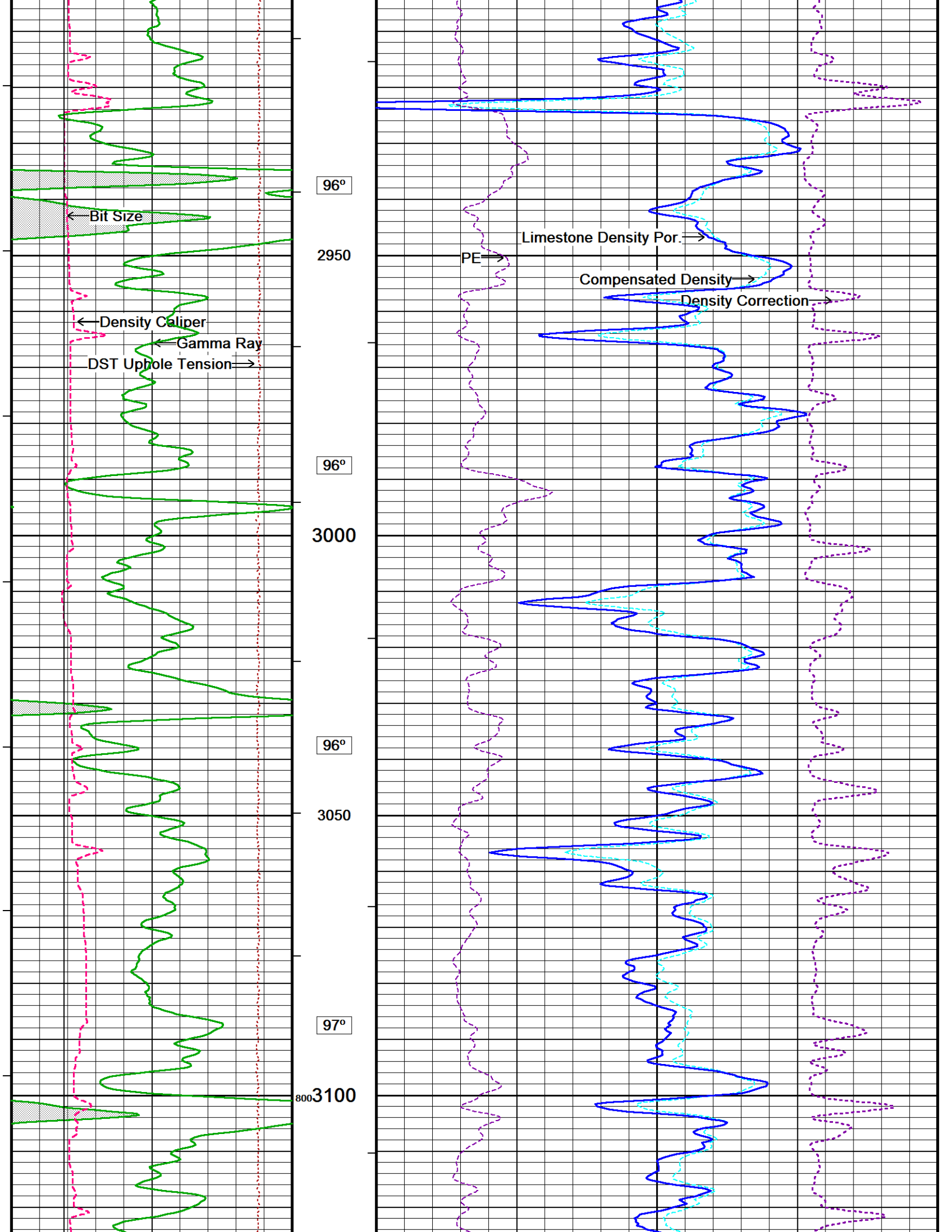
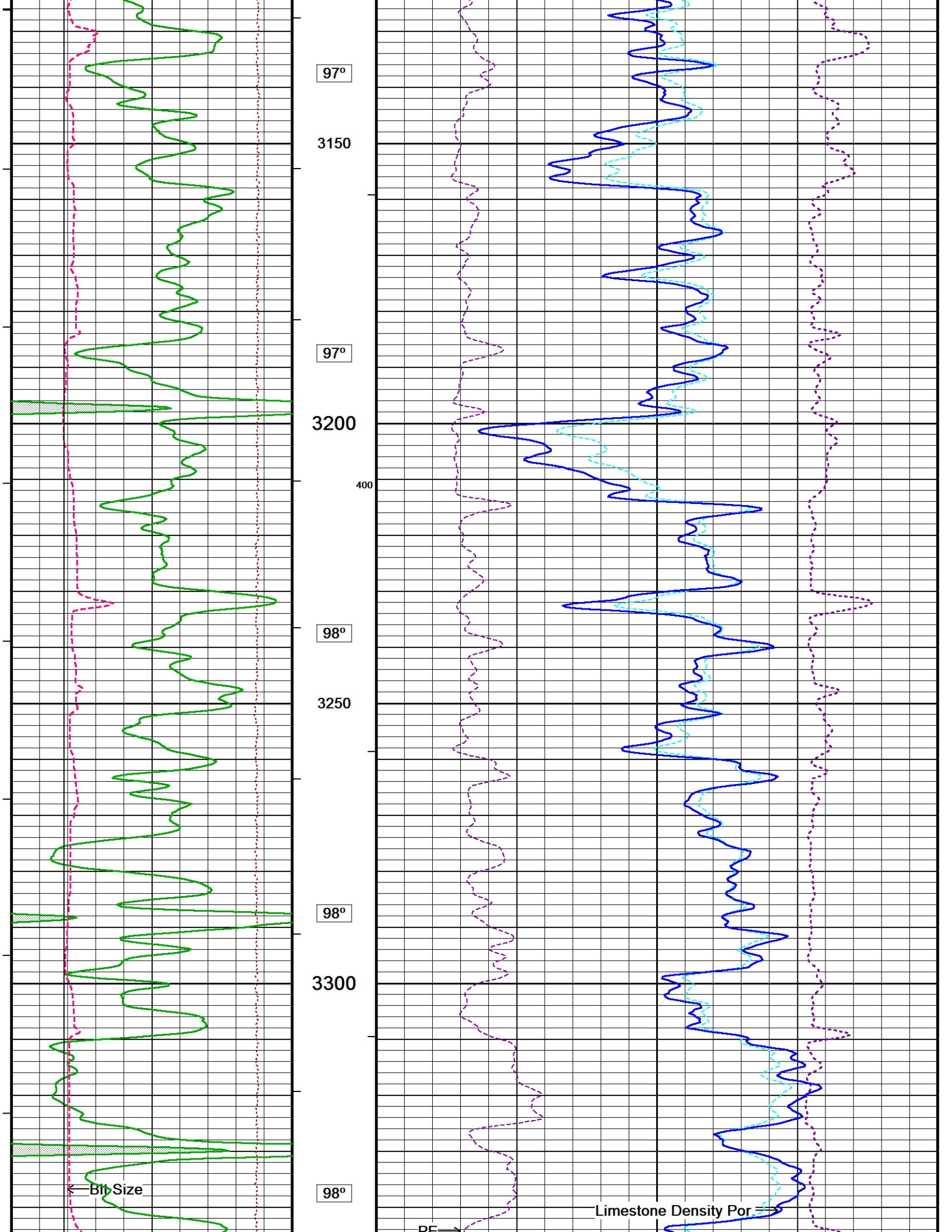


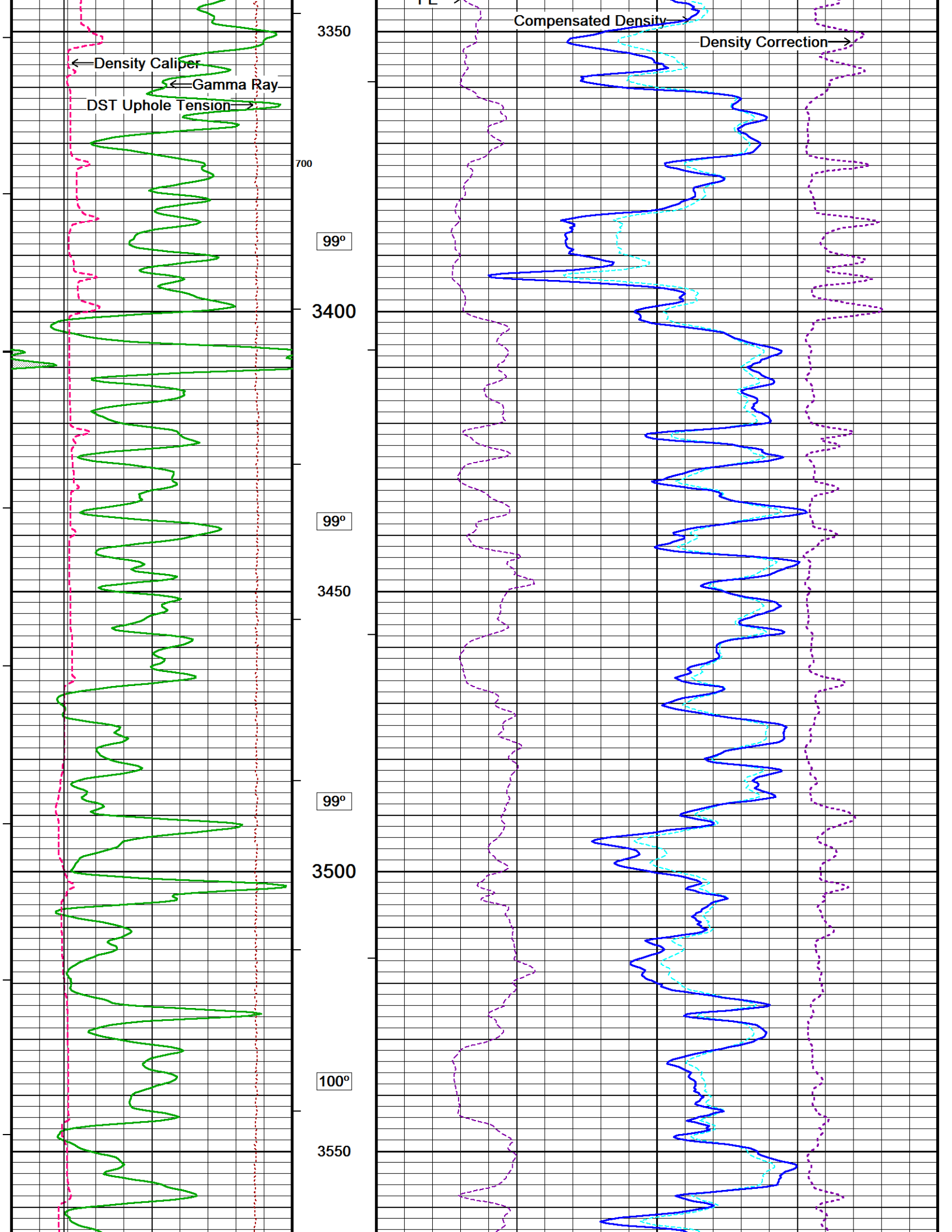

6
11
16
Bit Size
inches
6
11
16
Annular
Integral
every
10 cu ft
PE
barns/electron
0
5
10
Density Correction
grams/cc
-0.50
0
0.50
DST Uphole Tension
pounds
5000
0
Replay
Scale
1:240
2300
91°
2350
92°
2400
92°
2450

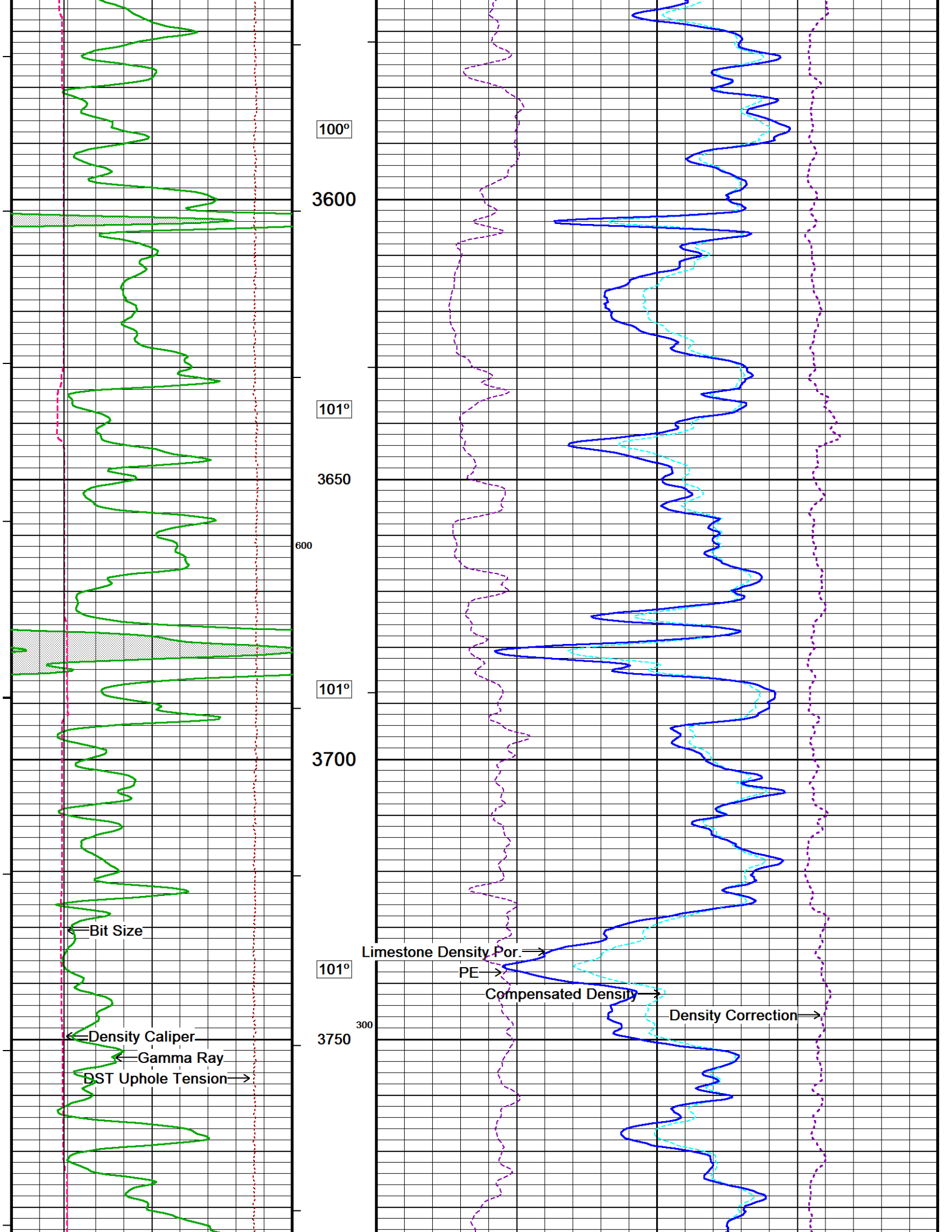

92º
2500
93º
1000
2550
Bit Size
Limestone Density Por.
PE
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
93º
2600
93º
2650

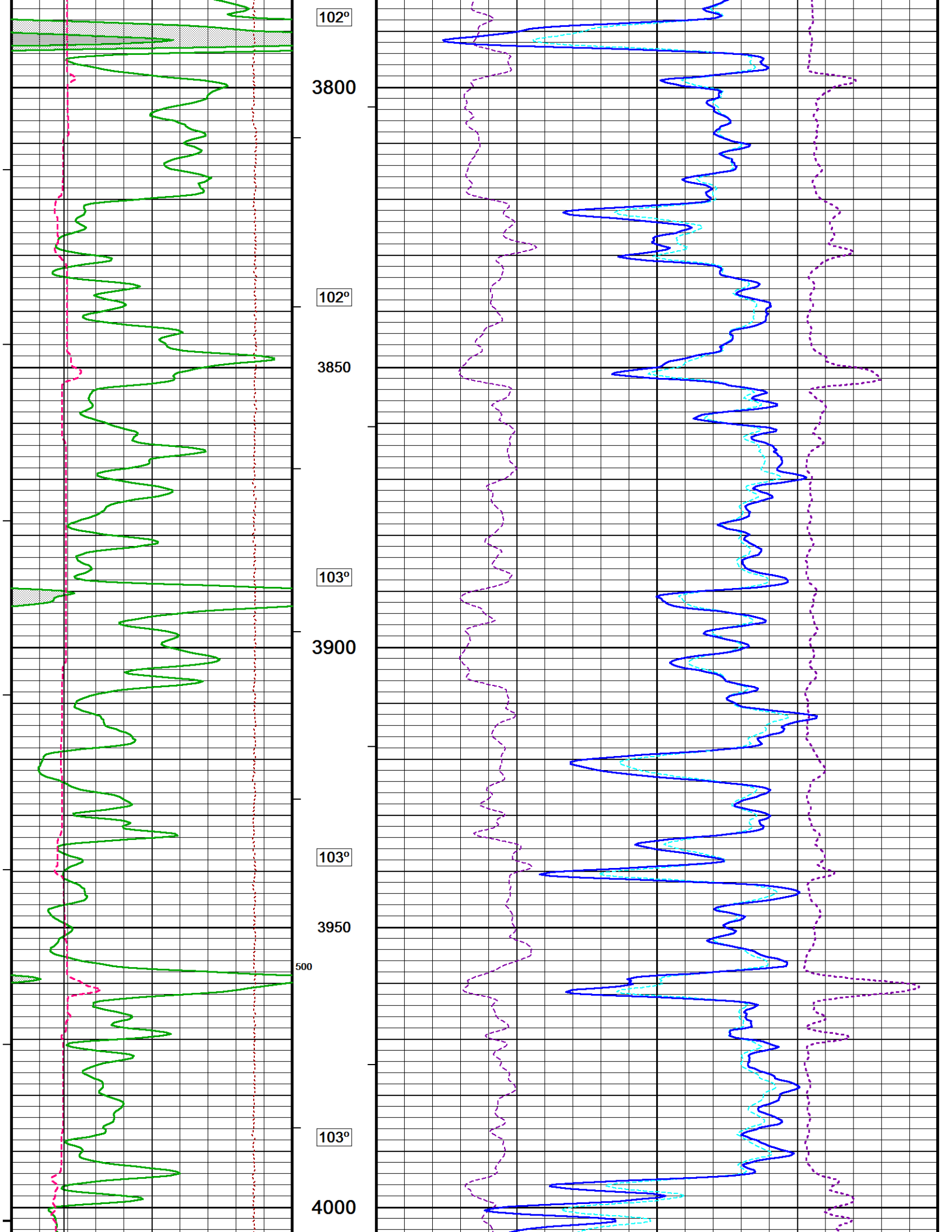

94°
2700
500
94°
2750
95°
2800
900
95°
2850
95°
2900

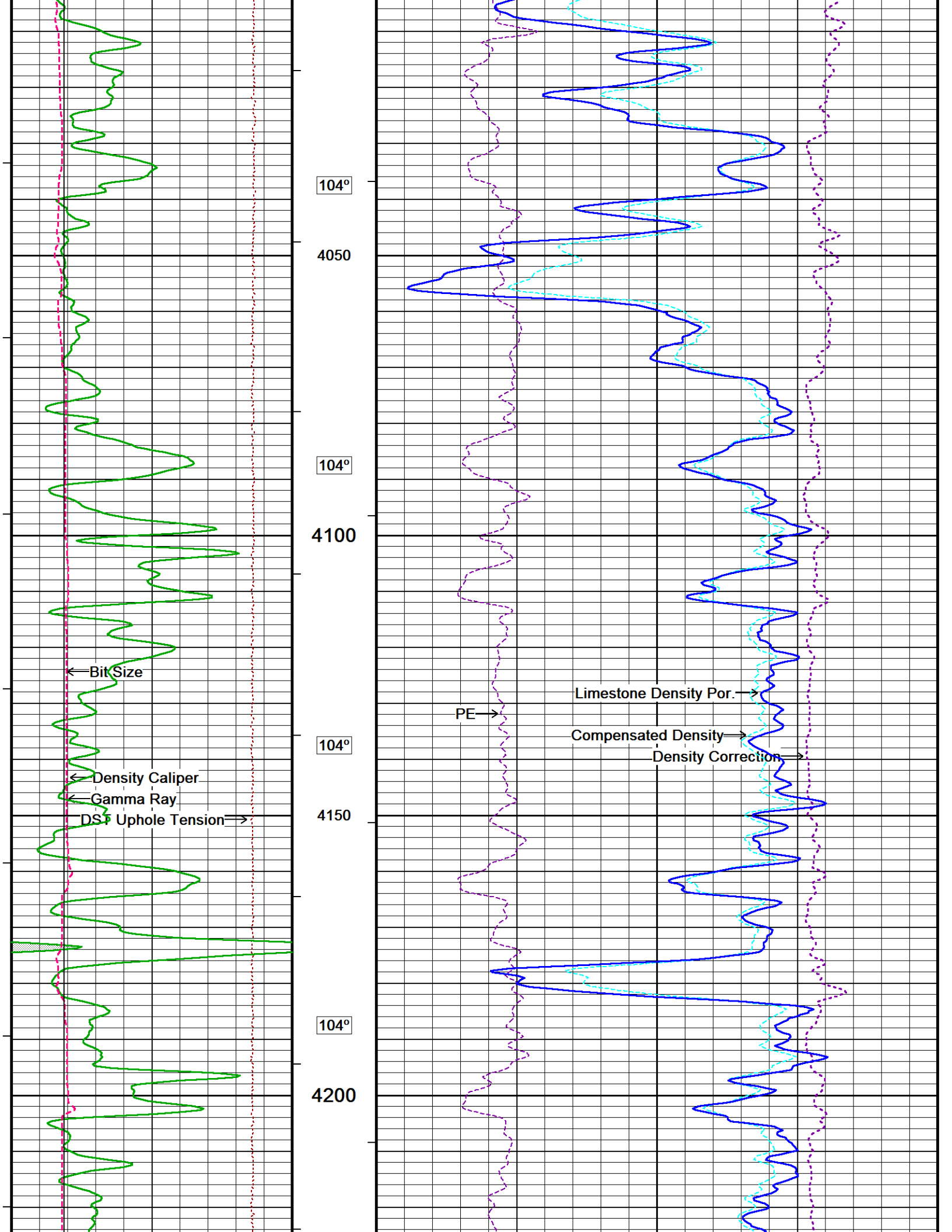

96°
Bit Size
2950
Limestone Density Por.
PE
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
96°
3000
96°
3050
97°
800
3100

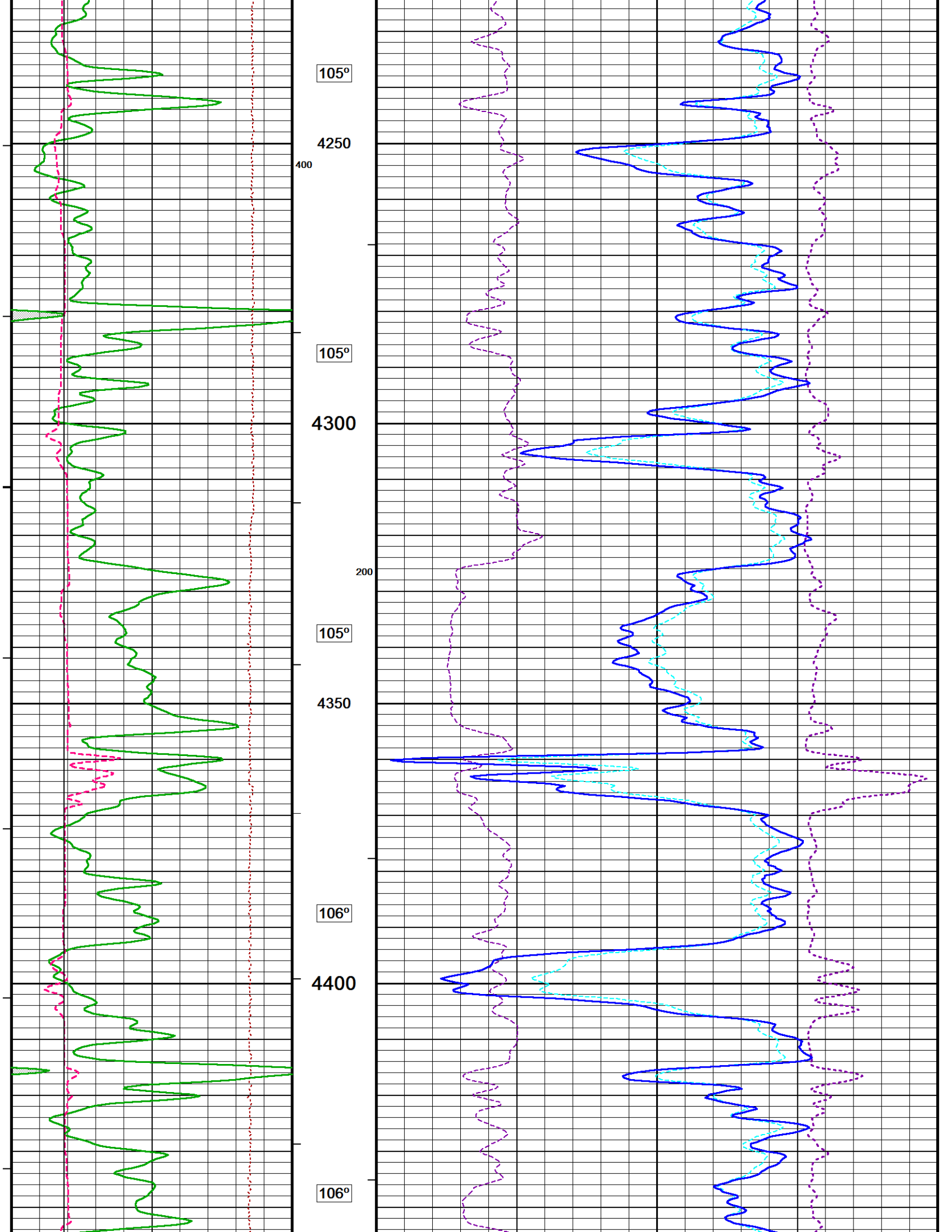

97°
3150
97°
3200
400
98°
3250
98°
3300
98°
←Bit Size
Limestone Density Por →
PE→

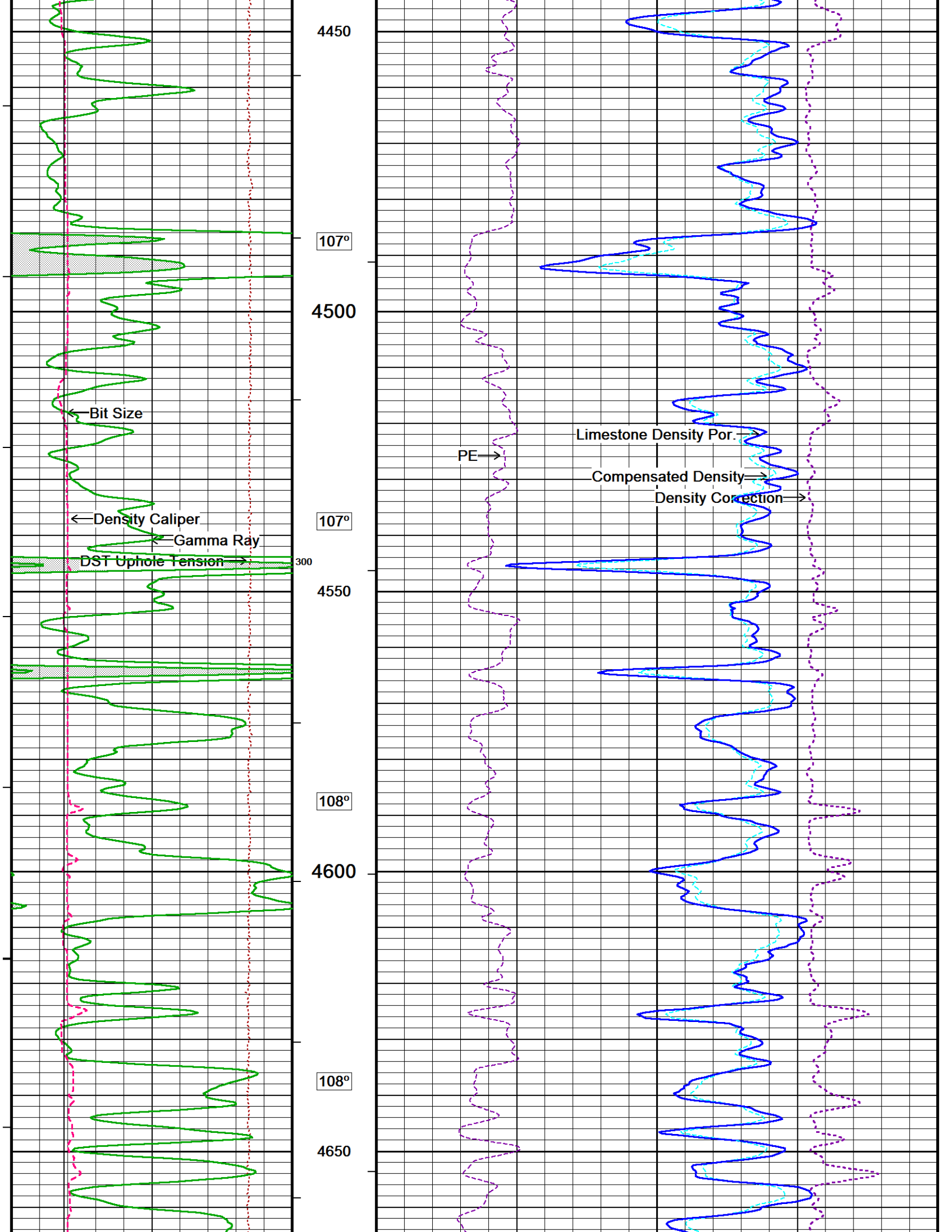

Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
3350
700
99°
3400
99°
3450
99°
3500
100°
3550

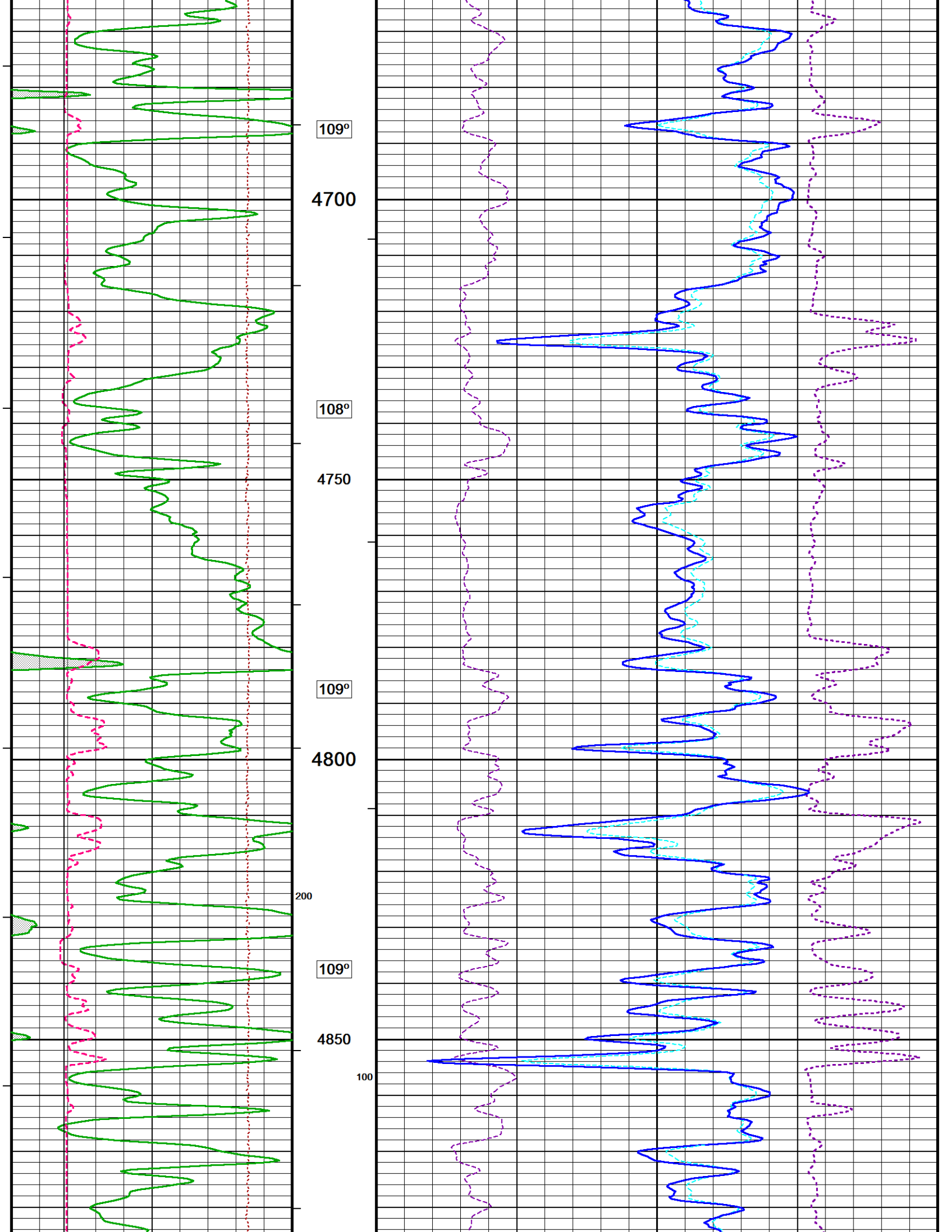

100°
3600
101°
3650
600
101°
3700
Bit Size
Limestone Density Por.
101°
PE
Compensated Density
Density Correction
300
Density Caliper
3750
Gamma Ray
DST Uphole Tension

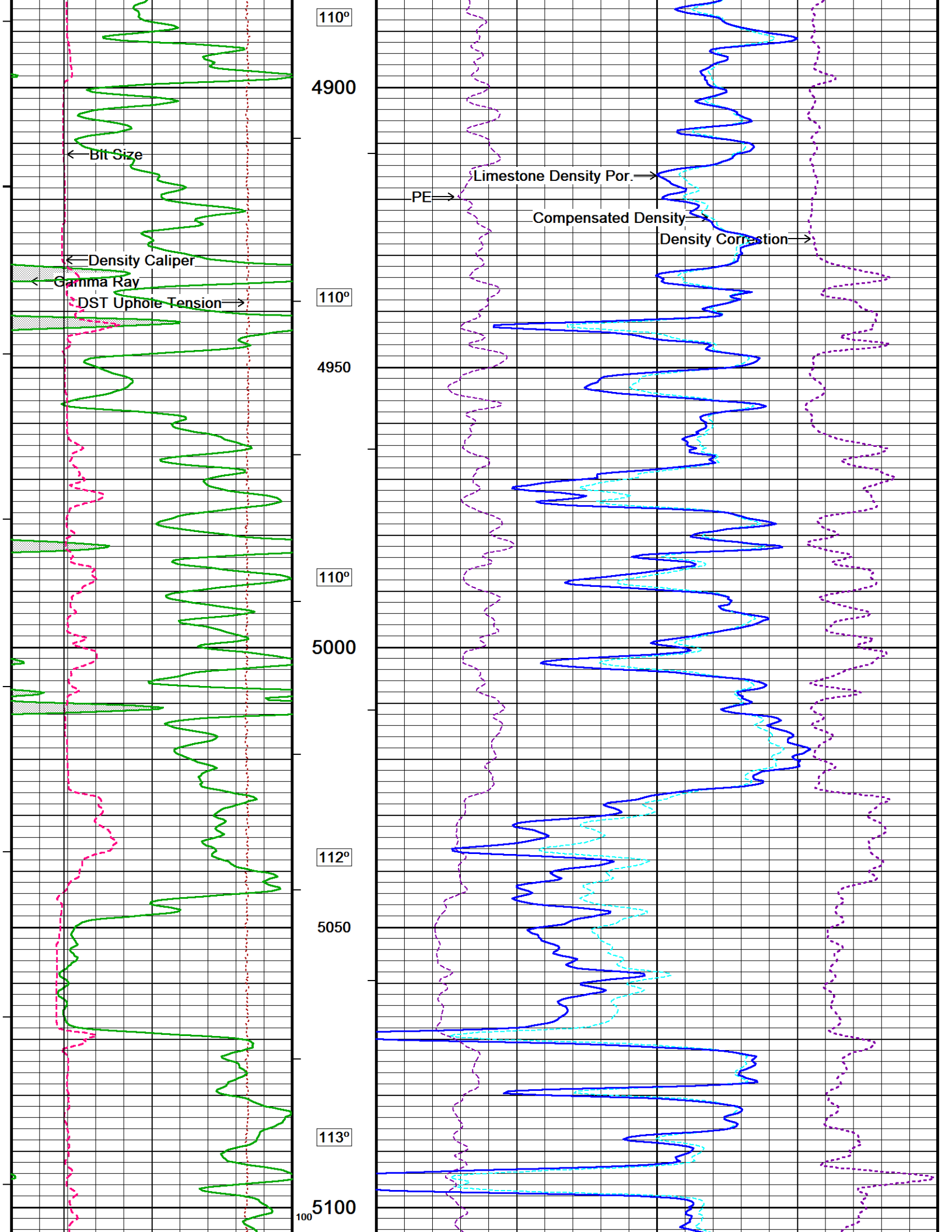

102°
3800
102°
3850
103°
3900
103°
3950
500
103°
4000

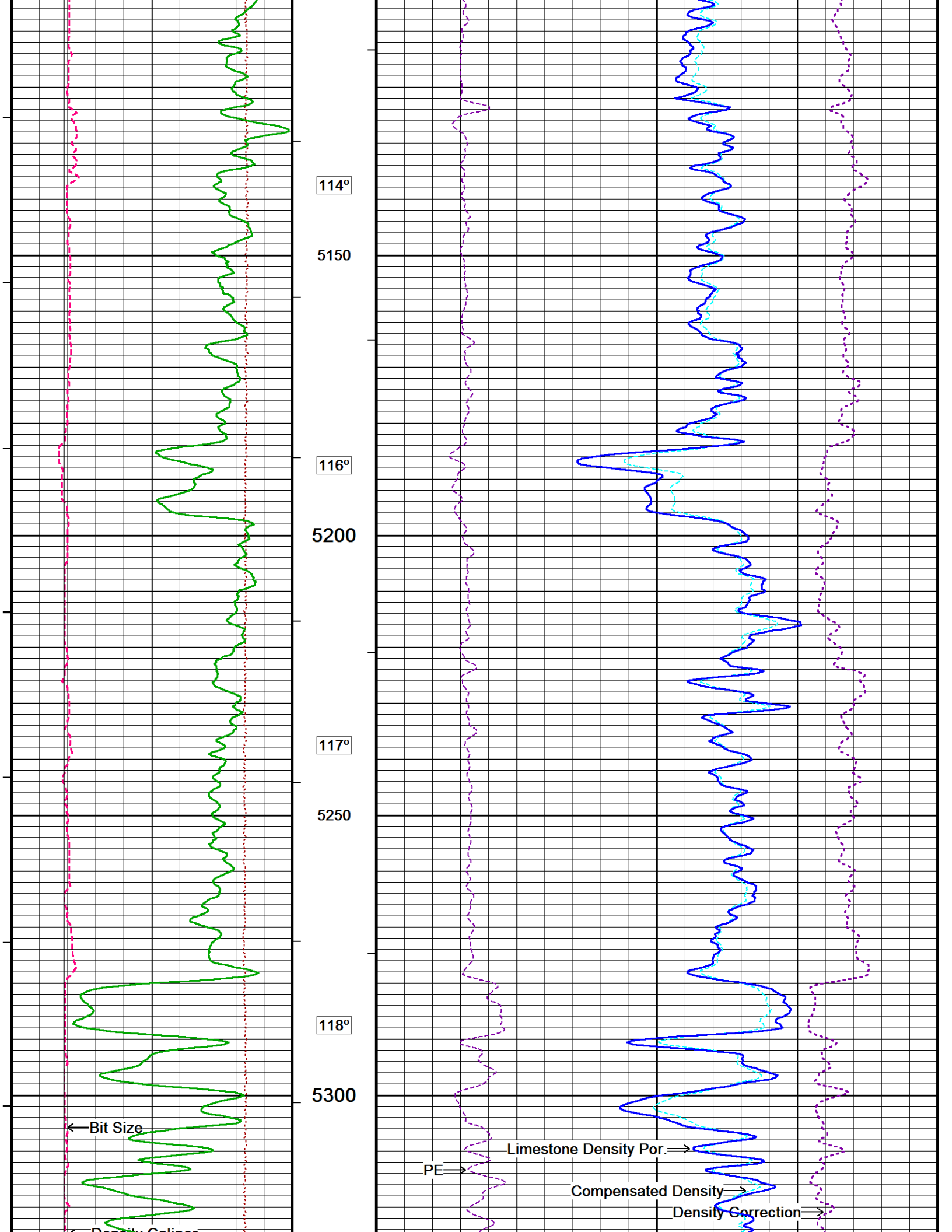

104°
4050
104°
4100
104°
4150
104°
4200
Bit Size
Density Caliper
Gamma Ray
DSI Uphole Tension
PE
Limestone Density Por.
Compensated Density
Density Correction

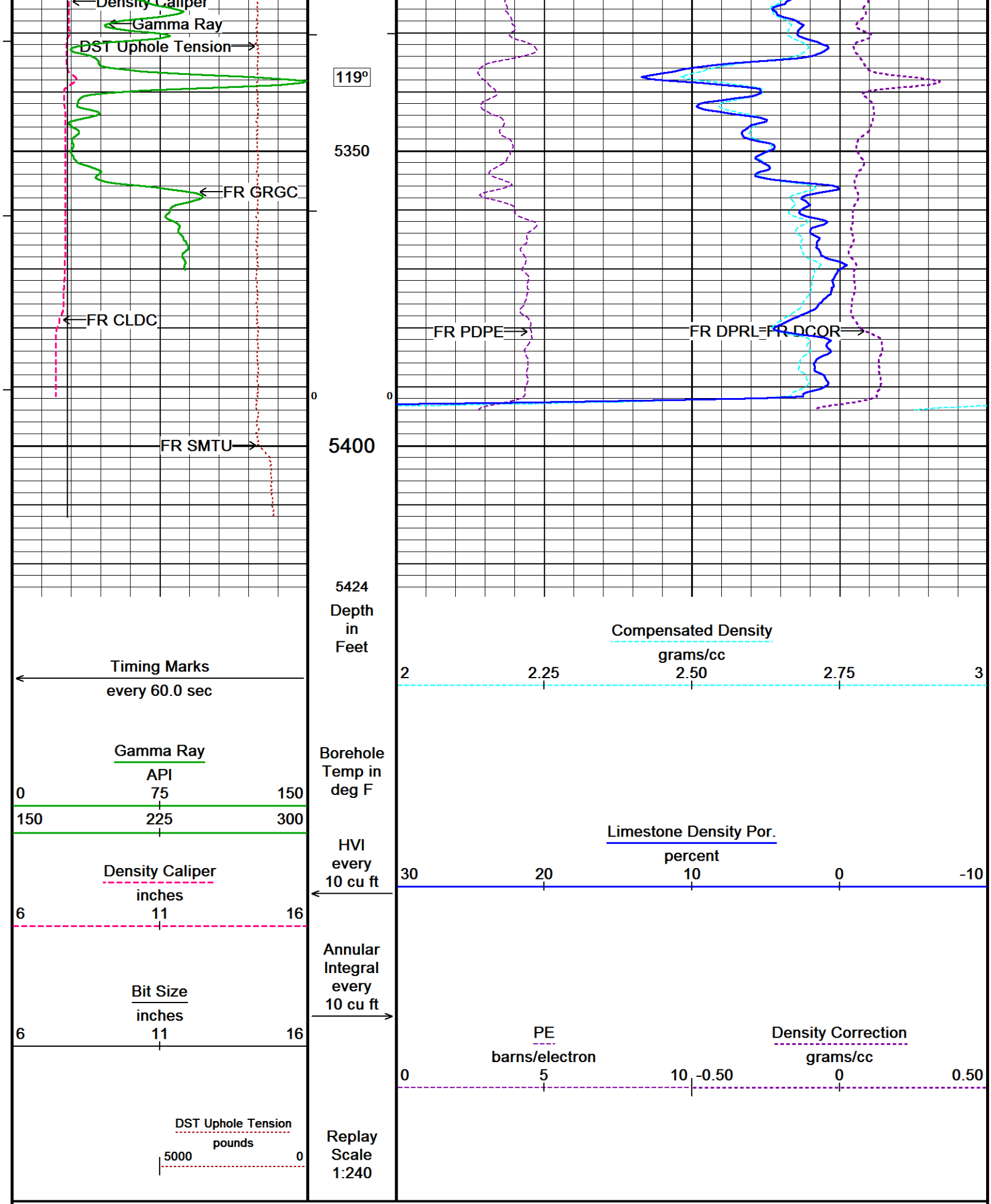

105°
4250
400
105°
4300
200
105°
4350
106°
4400
106°


4450
107°
4500
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
300
107°
4550
108°
4600
108°
4650
PE
Limestone Density Por.
Compensated Density
Density Correction


109º
4700
108º
4750
109º
4800
200
109º
4850
100


110°
4900
Bit Size
Limestone Density Por.
PE
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
110°
4950
110°
5000
112°
5050
113°
5100
100


114°
5150
116°
5200
117°
5250
118°
5300
Bit Size
Limestone Density Por.
PE
Compensated Density
Density Correction

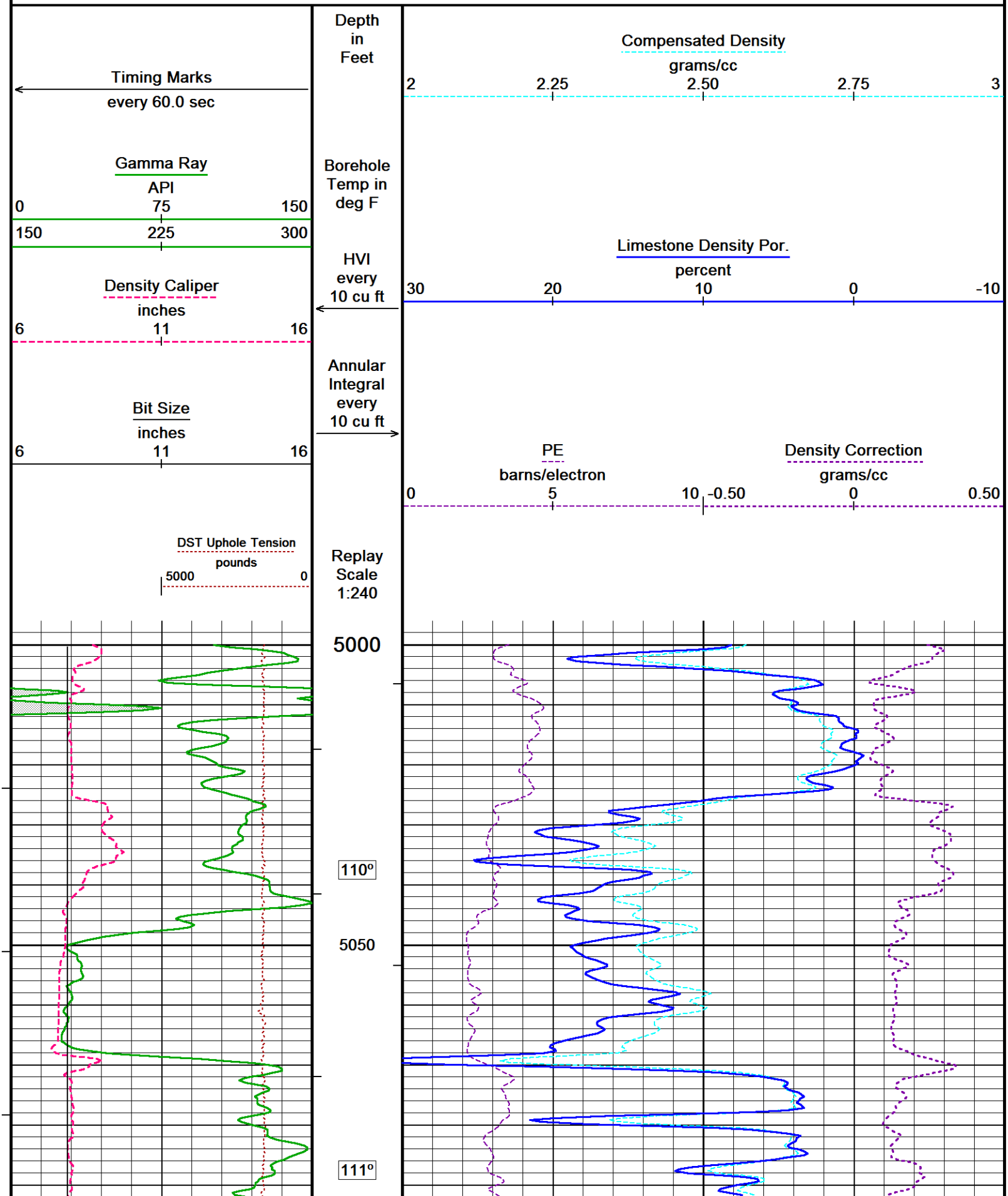


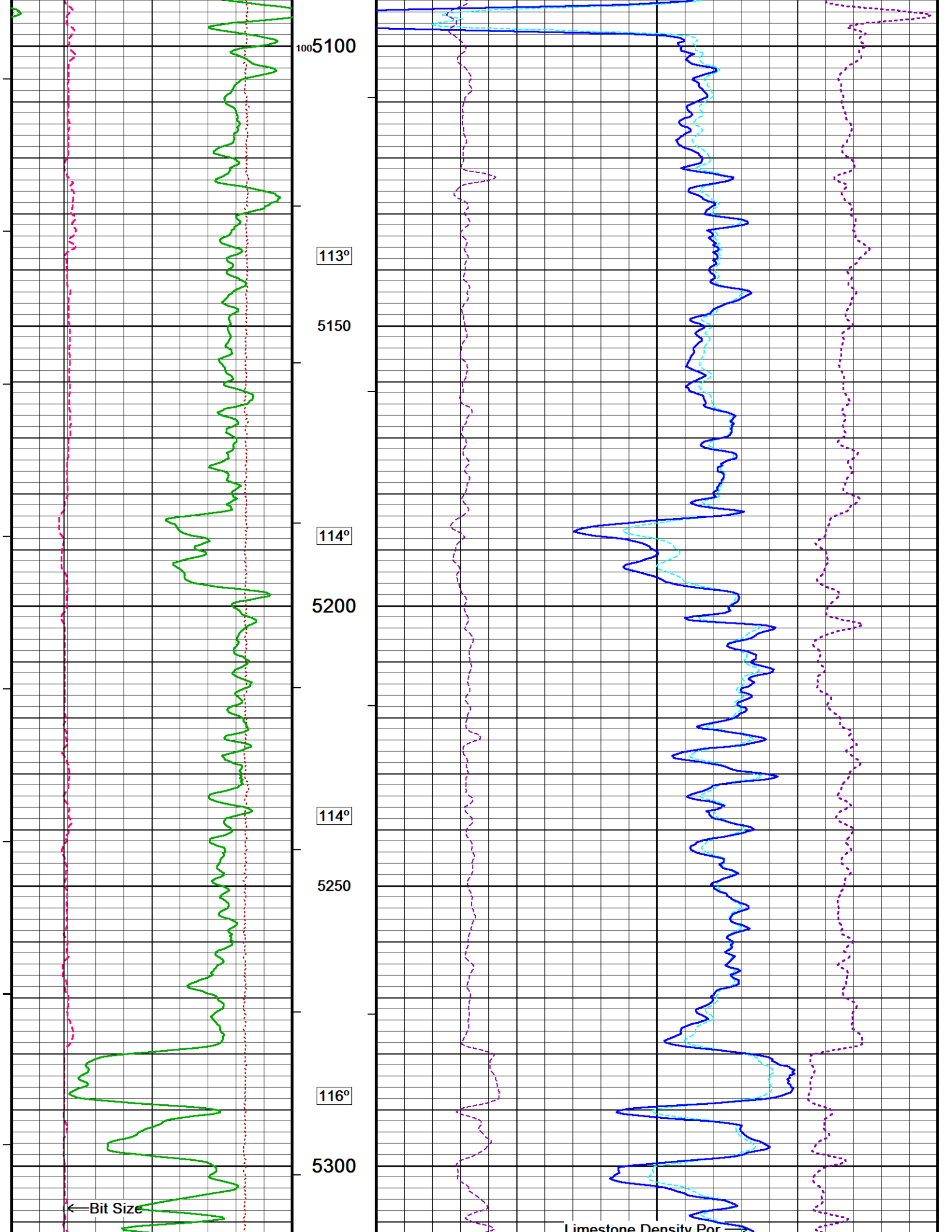
Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 18-JAN-2013 08:56
Filename: C:\Users\E143235\AppData\Local\Temp\Weatherford...\Western Operating Fox #1-8_002.dta
Recorded on 16-JAN-2013 14:37
System Versions: Logged with 13.04.8492 Plotted with 13.05.8506

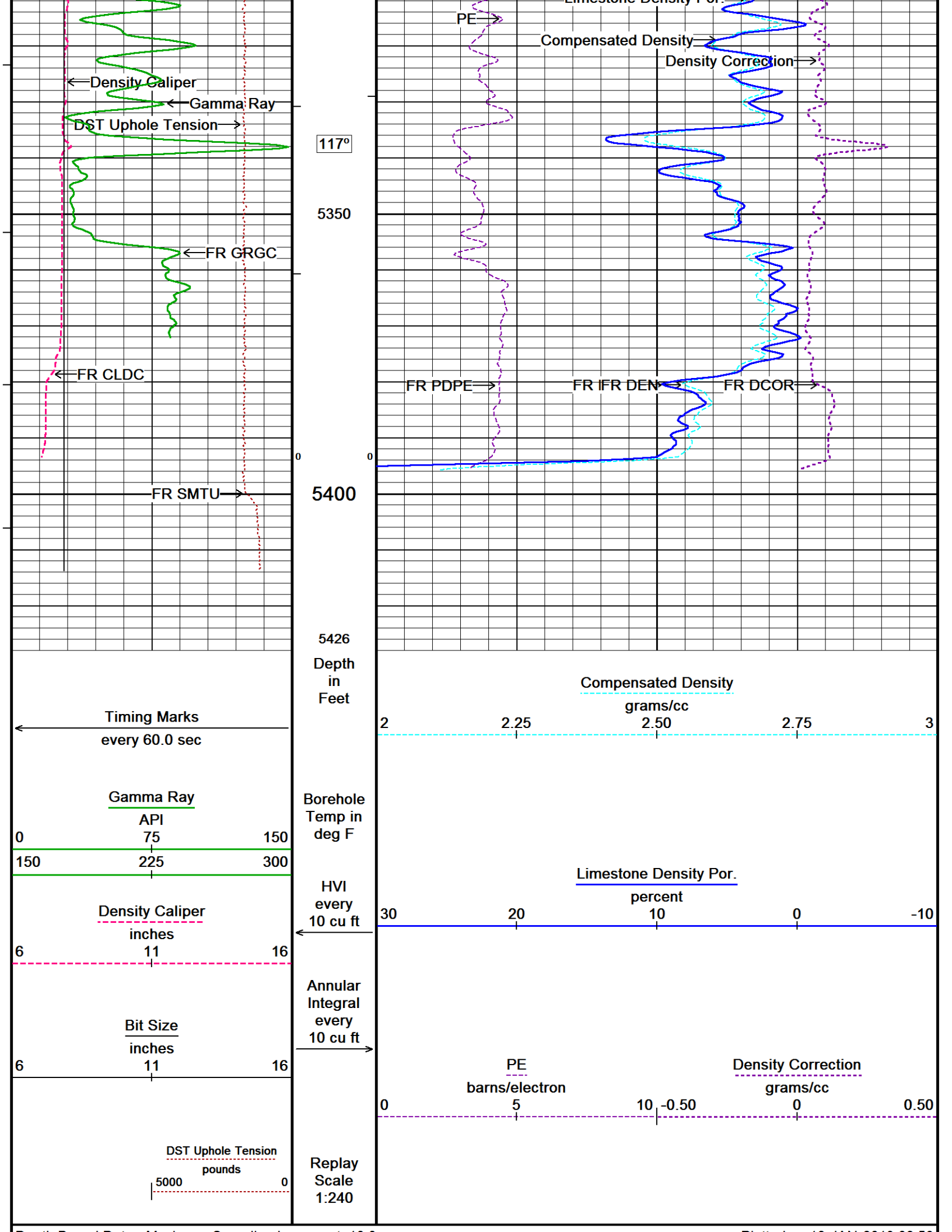
5 INCH MAIN

REPEAT SECTION

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 18-JAN-2013 08:56
Filename: C:\Users\E143235\AppData\Local\Temp\Weatherford...\Western Operating Fox #1-8_001.dta
Recorded on 16-JAN-2013 14:09
System Versions: Logged with 13.04.8492 Plotted with 13.05.8506




100
5100
113°
5150
114°
5200
114°
5250
116°
5300
←Bit Size
Limestone Density Por


Density Caliper
Gamma Ray
DST Uphole Tension
FR GRGC
FR CLDC
FR SMTU
PE
Compensated Density
Density Correction
FR PDPE
FR IFR DEN
FR DCOR
117°
5350
5400
0
0
5426
Depth in Feet
Timing Marks
every 60.0 sec
Gamma Ray
API
0 75 150
150 225 300
Density Caliper
inches
6 11 16
Bit Size
inches
6 11 16
DST Uphole Tension
pounds
5000 0
Borehole Temp in deg F
HVI every 10 cu ft
Annular Integral every 10 cu ft
Replay Scale 1:240
Compensated Density
grams/cc
2 2.25 2.50 2.75 3
Limestone Density Por.
percent
30 20 10 0 -10
PE
barns/electron
0 5 10
Density Correction
grams/cc
-0.50 0 0.50

REPEAT SECTION

BEFORE SURVEY CALIBRATION

C:\Users\E143235\AppData\Local\Temp\Weatherford PreView3\3\Western Operating Fox #1-8_001.dta

General Constants All 000

Last Edited on 16-JAN-2013,12:29

General Parameters		
Mud Resistivity	0.580	ohm-metres
Mud Resistivity Temperature	73.000	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	
Hole/Annular Volume and Differential Caliper Parameters		
HVOL Method	Single Caliper	
HVOL Caliper 1	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	Density Caliper	
Rwa Parameters		
Porosity used	Base Density Porosity	
Resistivity used	Array Ind. Four Res Rt	
RWA Constant A	0.610	
RWA Constant M	2.150	
SW/APOR Tool Source		

High Resolution Temperature Calibration MCG-B 34

Field Calibration on 08-NOV-2012,10:05

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	100.00	100.00

High Resolution Temperature Constants MCG-B 34

Last Edited on 08-NOV-2012,10:04

Pre-filter Length	11

Gamma Calibration MCG-B 34

Field Calibration on 16-JAN-2013 08:24

	Measured	Calibrated (API)
Background	70	47
Calibrator (Gross)	1141	772
Calibrator (Net)	1071	725

Gamma Constants MCG-B 34

Last Edited on 16-JAN-2013,12:29

Gamma Calibrator Number	GRC38	
Mud Density	1.13	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl	0.00	kppm
K Mud Type		
K Mud Concentration		%

Caliper Calibration MPD-B 64

Base Calibration on 13-DEC-2012 14:47
Field Calibration on 13-JAN-2013 17:09

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	12994	3.99
2	21855	5.98
3	30456	7.97
4	38925	9.86
5	48176	11.92
6	N/A	N/A

Field Calibration

	Measured Caliper (in)	Actual Caliper (in)

5.96 5.98

Photo Density Calibration MPD-B 64

Base Calibration on 13-DEC-2012 15:03
Field Check on 13-JAN-2013 17:07

Density Calibration

Base Calibration	Measured Near	Measured Far	Calibrated (sdu) Near	Calibrated (sdu) Far
Reference 1	59295	32863	59556	30836
Reference 2	24770	2893	24941	2541

Field Check at Base		
	1180.9	1372.2

Field Check		
	1176.5	1368.9

PE Calibration

Base Calibration	WS	Measured WH	Measured Ratio	Calibrated Ratio
Background	215	1052		
Reference 1	22270	59095	0.380	0.371
Reference 2	6705	24633	0.275	0.272

Field Check at Base		
	215.4	1052.3

Field Check		
	212.3	1049.2

Density Constants MPD-B 64

Last Edited on 16-JAN-2013,12:28

Density Source Id	18235B	
Nylon Calibrator Number	DNCE695	
Aluminium Calibrator Number	DACD698	
Density Shoe Profile	8 inch	
Caliper Source for Processing	Density Caliper	
PE Correction to Density	Not Applied	
Mud Density	1.13	gm/cc
Mud Density Z/A Multiplier	1.11	
Mud Filtrate Density	1.00	gm/cc
Dry Hole Mud Filtrate Density	1.00	gm/cc
DNCT	0.00	gm/cc
CRCT	0.00	gm/cc
Density Z/A Correction	Hybrid	

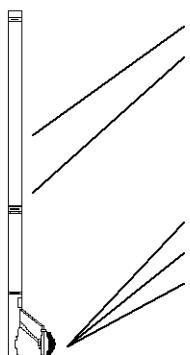
Matrix Density (gm/cc)	Depth (ft)
2.71	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00

DOWNHOLE EQUIPMENT

C:\Users\E143235\AppData\Local\Temp\Weatherford PreView3\3\Western Operating Fox #1-8_001.dta

Compact Comms Gamma
MCG-B 34 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-log
MML-A 16 LG: 7.97 ft WT: 81.6 lb OD: 2.24 in



42.87 ft GRGC - Gamma Ray
39.96 ft CGXT - MCG External Temperature
33.24 ft MINV - Micro-inverse
33.24 ft MNRL - Micro-normal
34.24 ft MLTC - MML Caliper

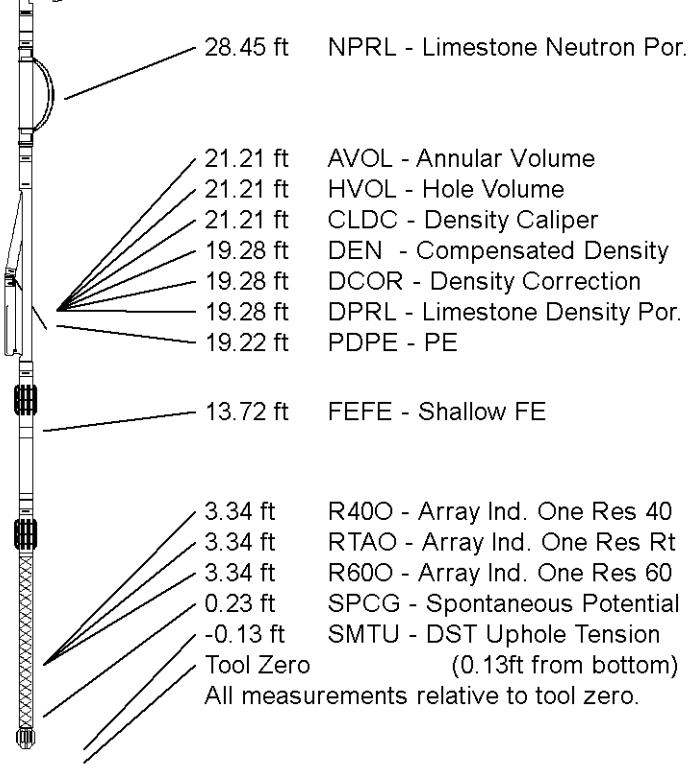
Compact Neutron
MDN-A.B 66 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper
MPD-B 64 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

Compact Focussed Electric
MFE-B.J 353 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction
MAI-A.A 167 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 48.16 ft Weight: 383.6 lb



COMPANY	WESTERN OPERATING COMPANY
WELL	FOX #1-8
FIELD	HELFRICH
PROVINCE/COUNTY	HAMILTON
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	3609.00	feet	First Reading	5381.00	feet
Elevation Drill Floor	3608.00	feet	Depth Driller	5400.00	feet
Elevation Ground Level	3596.00	feet	Depth Logger	5400.00	feet

Weatherford®

COMPACT PHOTO DENSITY COMPENSATED NEUTRON MICRORESISTIVITY LOG